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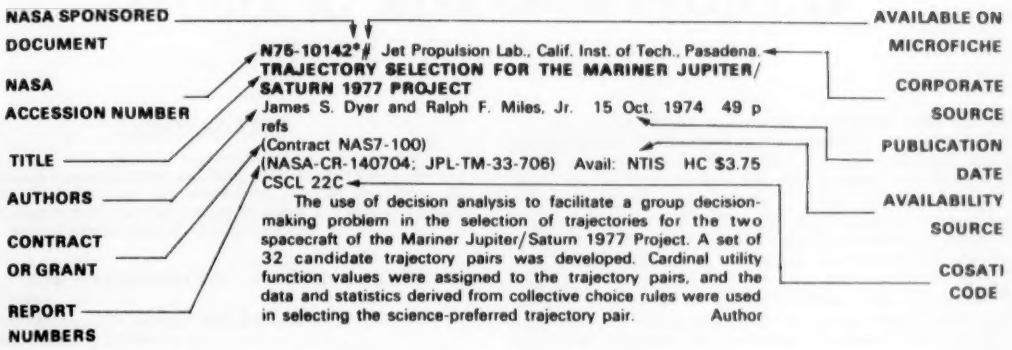
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N75-10142*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRAJECTORY SELECTION FOR THE MARINER JUPITER/ SATURN 1977 PROJECT
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p refs
(Contract NAS7-100)
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
CSCL 22C
The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author

ON-GOING RESEARCH PROJECTS

This is a listing of reseach projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power: Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, GSE TECHNOLOGY - HIGH ACCURACY TRACKING
B.H. CAMPBELL, U.S. Army, Gnd. Equipment & Materials Dir, *Huntsville, Alabama* 35809

The objective of this task is to provide a multiple gimbal test system to determine the isolation it provides against disturbances and the accuracy with which aircraft can be tracked using available sensors.

The approach to be used in accomplishing this task is to survey industries to determine the availability of a suitable gimbal system that can be readily adapted to the existing tracking mount. Determine the types of sensors that are available for use in a test program. Establish the interfaces between the existing mount, gimbal system and sensors.

Supporting agency address information: MICOM Ground Equipment & Materials Directorate, US Army Missile RD & E Laboratory, US Army Missile Command, Redstone Arsenal, Ala. 35809

SUPPORTED BY U.S. Dept. of Defense - Army

1.0002, NUMERICAL PREDICTIONS FOR UNSTEADY VISCOUS AERODYNAMICS
R.B. KINNEY, Univ. of Arizona, School of Engineering, *Tucson, Arizona* 85721

This research project is concerned with the numerical investigation of viscous unsteady flows. In particular, vortex distributions will be used to generate the body and assessment of the numerical accuracy of the computations will be made using exact solutions for comparisons. The unsteady viscous flow past a thick symmetrical airfoil will be computed using this surface vortex singularity distribution method. Boundary conditions will be satisfied by the proper adjustment of 'bound' and 'free' vorticity during computation. As a check on these computations, the Oseen approximation for vorticity transport will be solved using this method and compared with the known exact solution for Oseen flow past a semi-infinite flat plate.

SUPPORTED BY U.S. Natl. Science Foundation

1.0003, STUDY OF SUPPLY AND DEMAND EQUILIBRIUM IN SHORT HAUL AIR TRANSPORTATION
R. HORONJEFF, Univ. of California, School of Engineering, *Berkeley, California* 94720 (NAS 2-7879)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0004, IMPROVED FLOW VISUALIZATION BY USE OF RESONANT REFRACTIVITY
D. BERSHADER, Stanford University, School of Engineering, *Palo Alto, California* 94305 (AF-AFOSR-2670-74)

Air Force flight operations depend on the science of aerodynamics for the quantitative prediction of performance and on loads on vehicle surfaces, both for operational use and especially for rational design. Optical methods, viz shadowgraph, Schlieren, and interferometric, are important and long established tools of experimental aerodynamics. However, there is a need for obtaining highly increased sensitivity in these refractive optical methods so that subtle fluid dynamical phenomena such as weak vortices, sound waves, and low density flow fields can be made visible to the experimental fluid dynamicist. Resonant refractivity should provide this needed highly increased sensitivity in refractive optical systems. The goals of the present work are to develop a resonant refractive system for air and to demonstrate its use with a simple flow field.

Supporting agency address information: AF Office of Scientific Research NA, 400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0005, EVALUATION OF PHOTOGRAPHIC PLATES
J.E. DANBERG, Univ. of Delaware, School of Engineering, *Newark, Delaware* 19711 (DAAD05-74-C-0776)

The behavior of a missile in free flight is definitive once the values of its aerodynamic coefficients are known. These values can be obtained by analyzing measurements of the missile in flight. The performing organization assists in obtaining these measurements.

The performing organization measures the postion and orientation of the missile's shadow on the spark photography plates provided. The mesasurements are taken on man comparators or grid boxes provided by the government.

Supporting agency address information: AMC Ballistic Research Laboratories, Exterior Ballistics Laboratory, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

1.0006, AIR-GROUND SATELLITE DATA LINK DESIGN
J.L. LITTLE, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234

The Department of Transportation is involved with the International Civil Aviation Organization (ICAO) in designing a Common ICAO Data Interchange Network (CIDIN) to support the functions of international air traffic control. By employing standards already approved, or presently under development by the ISO (particularly those pertaining to data interchange and communications) a major part of the ground-ground portion of the CIDIN has been designed and tentatively approved by the participating countries. While it is intended to eventually pursue a similar approach in designing the air-ground portion of the CIDIN there are a number of administrative problems and political issues that must be resolved first. For example, over-the-ocean and local air traffic control communications must be compatible to minimize air-craft operator implementation costs. NBS is providing technical support to DOT.

Objective: To apply standards, approved or presently under development by ISO, to the design of an air-ground data link that will support the functions of both international and domestic air-traffic control.

Motivation: The continually increasing volumes of both domestic and international air traffic require that significant im-

provements be developed in air traffic control procedures to more efficiently allocate and utilize the limited air space. Data communications provides a means for automating certain of these control procedures. The international acceptability of a proposed system will be enhanced if its design is based upon standards approved or under development by ISO.

Approach: Participation in American National (ANSI X3S3) and International (ISO/TC97/SC6) committies and task groups developing data communication standards and with American (ATA) and International IATA) air transport association committees evaluating the technical feasibility and economic constraints of implementing an aeronautical data link. Develop proposed U.S. position papers for consideration by the Automated Data Interchange Systems Panel of ICAO pertaining to air-ground data link design.

Progress (FY 74): Continuing with work initiated during previous fiscal years (FY 72 and FY 73) NBS produced one memorandum and two technical papers dealing with various aspects of air-ground data interchange for consideration by Working Group 2 of ADISP. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

1.0007, COMPUTER AIDED DECISION MAKING FOR FLIGHT OPERATIONS
S. ROSCOE, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (F33615-73-C-1238)

The purpose of this procurement is to develop techniques for the design of an optimal computer-aided airborne decision-making system. Detailed examination of the human and machine functions and the allocation of those functions within the system is required. Further research in computer software areas of concept processing and automatic reasoning is required.

The approach to be utilized in this program is to determine the tasks performed during all phases of an airborne mission, to develop methods of describing those tasks to a computer, to develop schemes for making automatic deductions using both a priori and dynamic information, and develop techniques for automatic problem solving. A system using computer-aided decision making will be synthesized, simulated, and demonstrated as part of this program.

Supporting agency address information: AF Avionics Laboratory AAA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0008, COMPRESSIBLE VORTEX FLOW CHARACTERISTICS
V.U. MUIRHEAD, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NAS 1-12976)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0009, AIRCRAFT TAKE-OFF DATA STUDY
UNKNOWN, U.S. Small Business Admin., *Boston, Massachusetts* 02114 (055608 (TRAIS NO.))

The objective of this contract is to collect, process and analyze appropriate aircraft take-off data at Philadelphia National Airport. This airport had a representative distribution of jet transport traffic. A single runway will be selected for the data collection task. The data will include aircraft type, weight, flap setting, time of operation, rotation point dispersions, heights above the end of runway, departure path and intermediate heights.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0010, HIGH EFFICIENCY ELECTRICAL POWER PLANT USING DIESEL ENGINE COUPLED WITH ORGANIC RANKINE CYCLE ENGINE OPERATING ON DIESEL REJECT HEAT (ABBREV)
D.T. MORGAN, Thermo Electron Corporation, *Waltham, Massachusetts* 02154

More efficient conversion of heat to electricity is one of the most important goals of energy research. Diesel engines and gas turbines are both heat engines that normally reject heat to the atmosphere at high temperatures. The organic rankine cycle is a heat engine which has been demonstrated at only relatively low power levels. It accepts heat at temperatures that are typically 600-700 degrees F, comparable to reject heat from diesels and regenerated turbines. Initial studies have shown the basic feasibility of such a system. This additional study will better define the high risk areas associated with the organic vapor generator and high pressure ratio turbine. Possible instabilities and pressure losses will be identified in order to bring to an early solution or avoidance of such problems in follow-on efforts.

SUPPORTED BY U.S. Natl. Science Foundation

1.0011, DISTRIBUTIVE PARAMETER SYSTEMS FOR FLIGHT CONTROL
E.B. LEE, Univ. of Minnesota, School of Engineering, *Minneapolis, Minnesota* 55414 (AF-AFOSR-2243-72)

Throughout the development of aircraft the control system has played a significant but secondary role in determining aircraft performance. The availability of airborne computers and the increased reliability of electronic equipment promote the importance of applying modern control methods early in the aircraft design process to meet the performance specifications in a reasonable manner. As the speed and size of aircraft have increased, the demands placed on the control system have become more and more severe. For example, the capability of the control system for the C5A aircraft will probably be increased to prolong the fatigue life of the basic structure. Although present techniques for design and analysis have been usefully applied in flight controllers, several research directions are indicated as desirable. The first is to develop techniques to address the combined structural- control system design problem. Theory for the combined parameter and control system selection problem developed under this grant will be extended to include other problem constraints and models (with time delays and many degrees of freedom). The second area involves the expansion of techniques of the Nyquist-Bode type for the design and analysis of multivariate feedback systems. The third area of research concerns the application of quadratic optimal control theory in control system design. No realistic method exists for handling some physical constraints, such as spoilers on aircraft. Earlier work by the principal investigator on the bounded phase coordinate control problem will be considered in introducing the one-sided nature of such controllers.

Supporting agency address information: AF Office of Scientific Research NM, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0012, HIGH REYNOLDS NUMBER
S.M. BOGDONOFF, Princeton University, School of Engineering, *Princeton, New Jersey* 08540 (F33615-73-C-4156)

AF function - high speed aerospace vehicles. Deficiency - inability to predict aerodynamic loads and heat transfer on supersonic vehicles at high Reynolds numbers. Research - studies of turbulent boundary layer flows and turbulent flows which are separated and reattached. How research contributes - develops means of predicting aerodynamic loads and heat transfer on complex vehicle configurations as protection against catastrophic failures. The objective is to gain knowledge associated with turbulent boundary layers and viscous interaction at supersonic mach numbers. Included are studies of pure turbulent boundary layers with large separated flow fields and of flow reattachment of a supersonic turbulent free shear layer. This program's payoff to the Air Force will be in better predictions of aerodynamic loads and heat transfer of vehicles flying under conditions of high Reynolds numbers.

Studies of large separated and reattaching flow fields are being studied in a wind tunnel at m equals 3 and re is less than or equal to 10 super 9.

Supporting agency address information: Aerospace Research Laboratory LH, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0013, TRANSISTORIZED AIRCRAFT POWER CONTROLLERS FOR B-1 FLIGHT TEST
J. PARRELLA, Telephonics, *Huntington, New York* (F33615-74-C-2031)

To provide solid-state power controllers for flight test on the third RDT & E B-1 aircraft.

Phase I- Design and build breadboards to meet B-1 requirements. Test breadboards for load compatibility. Phase II- Build prototypes for flight test.

Supporting agency address information: AF Aero-Propulsion Laboratory POD, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0014, THEORY AND APPLICATION OF UNSTEADY FLOWS
W.R. SEARS, Cornell University, School of Engineering, *Ithaca, New York* 14850 (AF-AFOSR-2659-74)

Aircraft and their propulsion systems are subject to numerous examples of unsteady flows, i.e., flows which vary significantly with time in a fluctuating or pulsating manner, either irregularly or systematically. Prime examples are compressor and fan blading, buffeting wings, exterior store flutter, propeller and lift rotor blading. The unsteadiness of these flows forms the driving mechanism for noise generation, the driving forces for fatigue damage, and the cause of performance problems like compressor surge and stall, engine flameout, and speed placarding of combat aircraft carrying stores. The effort is an approach to some important aspects of unsteady flow theory and their applications in aeronautical practice. Topics to be addressed include unsteady boundary layer separation, unsteady impingement flows, noise due to bodies at transonic speed, sound and turbulence interaction, and flow problems involving change of phase. An important goal is to apply the results to the calculation of broadband fan, compressor, and turbine noise due to nonperiodic inflow variations.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0015, REYNOLDS NUMBER/BOUNDARY LAYER EFFECTS ON NOZZLE BOATTAIL EXTERNAL FLOW
A. FERRI, New York University, School of Engineering, *New York, New York* 10453 (F33615-74-C-3071)

The broad problem area of advanced turbojet/turbofan powered military tactical and strategic aircraft is the losses in range and performance attributed to external exhaust nozzle flow. The objective of this program is to determine the effect of Reynolds number and boundary layer variations on the external nozzle/boattail flow for transonic Mach numbers and test Reynolds numbers approaching flight Reynolds numbers.

Investigate the exhaust nozzle external flow of advanced military turbojet/turbofan powered strategic and tactical aircraft by using a unique wind tunnel facility to obtain experimental data describing the effect of Reynolds number and boundary layer variations on the exhaust nozzle external flow field.

Supporting agency address information: AF Flight Dynamics Laboratory FXM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0016, DEVELOPMENT OF A METHOD FOR COMPUTING SUBSONIC AND TRANSONIC SEPARATED FLOWS 12437-E
P.M. GERHART, Univ. of Akron, School of Engineering, *Akron, Ohio* 44304 (DAHC04-75-G-0026)

To develop an analytical method for computation of subsonic and transonic separated flows which is both practical and reasonably accurate for determining force changes on the body due to separation effects. This project is directly relevant to the transonic experimental and analytical work being done at MICOM, to the work on separated flows in exterior ballistics at BRL, and to the helicopter research program at AMRDL-Ames Directorate.

Based on the concept of dividing the flow field into viscous and inviscid regions, several essential elements for a successful computation procedure for separating, separated, and reattaching subsonic turbulent flows will be tried, utilizing the momentum and kinetic energy integral equations for the viscous flow and small- disturbance theory for the inviscid flow.

Supporting agency address information: AMC Army Research Office, Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

1.0017, SEPARATION AND GEOMETRICAL SINGULARITIES IN VISCOUS FLOWS
R.T. DAVIS, Univ. of Cincinnati, School of Engineering, *Cincinnati, Ohio* 45221

In this research program, flow problems with separation and shoulder singularities will be analyzed. The numerical method to be developed will attempt to combine the efficiency of the alternating direction implicit method for differential equations with the advantages of using the vector potential integral equation to represent the velocity field in terms of the vorticity field. The complete Navier- Stokes equations will be solved for subsonic and incompressible flow problems which include a region of separated flow. In particular, a critical assessment will be made of the role of boundary-layer theory in separation studies. Improved formulations of the flow problems will be sought through the development of more general optimal coordinate systems. Simple body shapes with leading edge singularities will be analyzed first; later studies will include bodies with other forms of singularity such as sharp shoulders.

SUPPORTED BY U.S. Natl. Science Foundation

1.0018, HIGH MACH COMBUSTOR INLET DIFFUSER
G.D. FULKERSON, U.S. Air Force, Aero Propulsion Lab., *Dayton, Ohio* 45433

The objective of this program is to investigate advanced diffusion techniques for turbopropulsion combustion systems. The techniques to be studied are those which investigations show will provide high pressure recovery and uniform velocity profiles at the diffuser exit. The investigation will entail the re-verification of experimental results for a straight-wall diffuser and a bleed diffuser as reported under GE contract F33615-72-C-1218. In addition to re-verification of the GE results, the effects of flow distortions on the performance characteristics of the diffusers will be investigated. The experimental effort will employ hardware provided under the GE contract and other sources.

To accomplish the above objectives, the following steps will be taken: 1) Literature review of the subject area will be conducted, 2) Design and procurement of test apparatus necessary to experimentally examine diffuser models, 3) Experimentally evaluate diffuser model performance relative to different inlet velocity profiles, swirl angles, bleed rates and combinations thereof, and 4) Analyze data and evaluate performance of the diffuser configurations.

Supporting agency address information: AF Aero-Propulsion Laboratory TBC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, MAGNETIC BUBBLE MEMORY
J.L. ARCHER, Rockwell International Corp., *Anaheim, California* 92803 (F33615-73-C-1103)

The objective of this effort is to develop the technology for a high density, low cost, lightweight, radiation tolerant, low power memory meeting the requirements for airborne and spaceborne mass memory as outlined in SAMSO-TN-24-71-102 and ESD-TN-69-24-03. These systems require memory capacities up to

100 million bits, no moving parts, speed to 32 million bits/second, cost below 0.1 cent/bit, and radiation tolerance.

This effort will emphasize design, layout, fabrication, and evaluation of megabit per sq. in. bubble density memory planes, passive temp compensation of the bias fields, ageing and passivation of permalloy propagation and detector structures, and system design analyses for airborne/spaceborne applications. Topics to be investigated in FY73 are passive bias field temp compensation, and ageing and passivation of permalloy propagation and detector structures. Topics for investigation in FY74 are electronics for enhancing nonvolatility, electronics for bubble control (generation and annihilation) and reliability and system design analyses for airborne/spaceborne applications. Optimum test vehicles will be designed and evaluated in detail, paper study only. Topics for FY75 include researching the causes for unpredictable start-stop operation and developing the documentation for device element operating characteristics for elements operating on cage garnet compositions at high speed.

Supporting agency address information: AF Avionics Laboratory TEA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0002, QUASI-ELECTRIC FIELDS EXPERIMENT FOR ISSE MOTHER/DAUGHTER SPACECRAFT
F.S. MOZER, Univ. of California, School of Letters, *Berkeley, California* 94720 (NAS 5-20080)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0003, PLASMA INTERACTION BETWEEN ION THRUSTER AND SOLAR ARRAY
H.R. KAUFMAN, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (NSG 3038)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0004, HIGH RESOLUTION SOLAR ACTIVITY INVESTIGATION
P.M. KALAGHAN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - communication and detection. Deficiency - polar communications and detection systems are severely degraded by solar proton flares. Objective - to establish from ground based radio observations, a technique for predicting which active regions are capable of producing proton flare. How research contributes - permits advance warning of the occurrence of a solar proton event which seriously effects AF missions in space, polar cap communications, and satellite orbit positions.

High resolution observations of the intensity and polarization signatures of individual active regions in the wavelength range from 3cm to 8mm will be obtained and employed as a data base for the determination of a dynamic model of the development cycle of an active region. Time variations within this model will be investigated in order to identify pre-flare signatures. Proton flare prediction criteria will be developed, tested, and subsequently incorporated into SESS (AWS) operational procedures.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0005, ULTRA-SENSITIVE ACCELEROMETER DENSITY MEASUREMENTS
D.H. FRYKLUND, Accumetrics Corporation, *Cambridge, Massachusetts* (F19628-73-C-0112)

AF function - airborne surveillance and weapons delivery. Deficiency - accurate ephemeris computations for low altitude operational satellites cannot be made because of lack of adequate density data. Research - rocket instrumentation and improved telemetry for accurate density measurements in the 30 to 150 km altitude range. How research contributes - density data in this altitude range can greatly improve the accuracy of missile and satellite trajectory calculations. The objective of this work is to develop more refined rocket-borne instrumentation and techniques for obtaining atmospheric density measurements to determine mean model values and extremes of departure about mean values under varying atmospheric conditions. A major portion of the effort under this procurement will be applied toward optimizing accelerometers and other payload sub-systems for improved capabilities in the detection of density variations.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, WORK FUNCTION EVALUATION OF IRON-NICKEL ALLOYS AND OTHER METALS FOR LOW TEMPERATURE THERMIONIC ENERGY CONVERTERS
S.B. PARSONS, Arizona State University, Graduate School, *Tempe, Arizona* 85281 (NSG 7019)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0002, MEMBRANES BY PLASMA POLYMERIZATION
A.T. BELL, Univ. of California, School of Engineering, *Berkeley, California* 94720 (NSG 2043)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0003, PREPARATION AND IDENTIFICATION OF HYBRIDS OF INTERMETALLIC COMPOUNDS
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Diego, California* 92115 (NSG 3034)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0004, SAMPLE COLLECTED FROM SOLID FUEL ROCKET EXHAUSTS AND FROM THE NATURAL STRATOSPHERE
I. HARDINGBARLOW, Univ. of San Francisco, Graduate School, *San Francisco, California* 94117 (NSG 2051)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0005, TESTING A RECENT PLATONIZATION THEORY
A. COHEN, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

It is believed that the importance of lead in the ballistic modification of nitric ester-based propellants is due to its catalytic effect on carbon formation. Solid carbon then acts as a catalyst for the exothermic reactions of nitric oxide with fuel such as aldehydes, carbon monoxide and hydrogen. At higher pressures the reaction with carbon becomes appreciable, thus decelerating the exothermicity giving rise to 'mesa' region. The objective is to test this hypothesis.

The initial effort will be to determine the catalytic effects of solid carbon, solid and gaseous lead compounds on the reactions of aldehydes with nitric oxide. The effects of lead and carbon on explosion delays in the acetaldehyde-nitric oxide system will be determined at initial temperatures between 1000-2000 degrees K and pressures between 5-150 psi. The explosions will be initiated by shock waves and the experiments will be performed in a shock tube using a reflected shock technique.

Supporting agency address information: AMC Ballistic Research Lab, Aberdeen PG, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0006, JET GRINDING OF ALUMINUM TO INCREASE COMBUSTION EFFICIENCY
A.J. COLLI, U.S. Navy, Ordnance Station, *Indian Head, Maryland* 20640

To increase the combustion, efficiency and burning rate of propellants containing particulate aluminum.

Particulate aluminum and selected alloys of aluminum will be ground to form ultra-fine powders. The finely divided metals will be incorporated into a propellant and combusted to determine the efficiency of combustion.

Supporting agency address information: Naval Sea Systems Command, Washington, D.C. 20360

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0007, DOUBLE BASE PROPELLANT TECHNOLOGY
T.D. AUSTIN, U.S. Navy, Propellant Science Department, *Silver Spring, Maryland* 20910

A series of double-base propellants with tailored properties and service capability will be developed. These will utilize sorbitol pentanitrate as a replacement for nitroglycerin and make use of new mesa producing ballistic modifiers.

Sorbitol pentanitrate (pentasorb)-conditions for preparing this energetic plasticizer will be optimized. Process documents and specifications will be written. Propellant containing pentasorb (pentasol)-mesa burning castable propellants will be formulated and prepared first on a laboratory then on a pilot plant scale. Extruded propellants will be processsed on a pilot plant scale. Each one of these experimental propellants will be evaluated (b.r., hazard, mechanical properties) and if possible test fired. Ballistic modifiers - ng and nc with and without ballistic modifiers will be exposed to uv-radiation of 230 mu and 330 mu wavelength and the intensity of their fluorescence line at 430 mu will be measured. The difference in rates of photolysis will establish or negate the existence of a photosensitized mechanism.

Supporting agency address information: Naval Ordnance Systems Command ORD-0331, Washington 25, D.C. 20376

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0008, IMPACT PROPERTIES OF GRAPHITE FIBER REINFORCED COMPOSITE MATERIALS
M.A. KORNITZKY, U.S. Army, Materials & Mechanics Res. Ct., *Watertown, Massachusetts* 02172

To quantify the effects of low velocity impact and foreign object damage on graphite fiber reinforced composite materials. To generate possible solutions to the problem of low impact strength of these composites. The hlh atc program shows that, in certain applications, these composites have poor impact resistance and foreign object damage tolerance. This project is responsive to the major RDT & E program thrust No. 4.a. Aircraft survivability and to the pacing materials problem area vulnerability and survivability of rotor blade components.

Testing of composite samples will be continued. The amount of energy necessary to cause damage, the energy absorbed by the sample, and the type and propagation mode of the failure will be determined. These data will be correlated with the fiber strength, fiber modulus, fiber surface treatment, resin type, and sample construction. The results of these correlations will be used to indicate possible solutions for the problem. Possible modifications to be investigated include- the incorporation of other materials such as kevlar-49, fiberglass and graphite film- incorporation of rubber particles in the resin- changing the resin- and varying the structure of the composite panel.

Supporting agency address information: AMC Materials & Mechanics Rsch. Ctr., AMXMR-RD, Watertown, Mass. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0009, EVALUATION OF METHODS TO PRODUCE AVIATION TURBINE FUELS FROM SYNTHETIC CRUDE OILS
H. SHAW, Exxon Res. & Engineering Co., *Linden, New Jersey* 07036 (F33615-74-C-2036)

This program will be conducted in three phases. The objective of Phase I is to determine which raw materials and processes will provide refinery feedstocks most amenable to production of finished aviation turbine fuel. Raw materials will include coal and oil shale and their individual sources. The objective of Phase II is to provide an experimental base in support of production of aviation turbine fuel from synthetic crude oil. Phase III will provide an overall assessment of material, equipment and processing requirements for producing the high yields of aviation turbine fuels from coal and oil shale.

Phase I will consist of an engineering analysis and include a literature survey. Raw materials, processes, synthetic crude oils and refinery feedstocks will be selected for further study in the later phases. Phase II will be limited to laboratory bench scale experimentation as pilot plant work is not within the scope of this program. Under Phase III requirements unique to production of aviation turbine fuels to production of other liquid products (gasoline, heating fuels, etc.) will be identified.

Supporting agency address information: AF Aero-Propulsion Laboratory SFF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0010, PHOTOEMISSION STUDIES OF THE ELECTRONIC STRUCTURE OF METAL, ALLOYS AND COMPOUNDS
D.E. EASTMAN, Internat. Bus. Machines Corp., *Yorktown Heights, New York* 10598 (F44620-70-C-0089)

Modern aerospace electronic systems depend heavily upon solid state electronic and optical devices. Future improvement in performance of these devices requires a thorough understanding of the electronic structure and excitation processes in selected solids. Present solid state electronic and optical devices are based upon the properties of a relatively small percentage of the total number of materials potentially available. This research experimentally investigates the electronic and optical properties of semiconductors, selected transition metals, transition metal compounds, lanthanide compounds, layered compounds, actinide compounds, organic solids and organometallic complexes using photoemission measurements in the 5 to 100 ev photon energy range together with energy band analysis. The objective of this research is to provide knowledge on the electronic structure, electronic transitions and interactions, and optical properties over a wide energy range in material currently under investigation for microwave device improvement as well as in materials with device potential but hitherto unexplored.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0011, ELEMENTARY RATE CONSTANTS FOR HYDROGEN ATOMS
J.V. MICHAEL, Carnegie Mellon University, School of Arts, *Pittsburgh, Pennsylvania* 15213 (AT(11-1)-3242)

The objective of this project is to use the apparatus which has been assembled and already to use to measure rate constants for elementary processes where H atoms are either a reactant or product. Three apparatuses are proposed for continuing support out of six apparatuses which have been operational in the past and have yielded results of interest to chemical kineticists. These three are: (a) transient Lyman alpha absorption photometry from mercury photosensitization of H2, (b) Lyman alpha absorption photometry in a shock tube, and (c) discharge-flow with time-of-flight mass spectrometric detection. Several rate constants of H and D with substrates have already been measured and understood in terms of modern theories of chemical kinetics. This theoretical work is proposed for continuance also.

The results which have been obtained to date are of interest to chemical kineticists in radiation chemistry, photochemistry, and thermal chemical kinetics. Reliable elementary rate constants are necessary for understanding complex chemical systems such as combustion, photochemical smog, and upper atmospheric chemistry. Results to date are also of interest to theoretical kineticists. New experimentation will concentrate on high temperature reactions. Also abstraction studies will be continued. Also the use of rare gas resonance lamps as photoionization sources for mass spectrometry will be researched. Studies with other atomic species than H or D will be started.

SUPPORTED BY U.S. Energy Res. & Development Admin.

3.0012, INORGANIC PHOTOELECTRON SPECTROSCOPY, MASS SPECTROMETRY, AND THERMOCHEMISTRY RELATED TO FUELS AND POLYMERS
M.F. LAPPERT, Univ. of Sussex, *Sussex, England, United Kingdom* (AF-AFOSR-2220-72)

Air Force rocket and missile solid propellants need improved carborane type burn-rate regulators. Also boron-group IV element inorganic polymers are needed for the development of structural and other high temperature applications. It is proposed therefore to study bonding and thermochemistry of simple compounds of boron and the group IV elements Si, Ge and Sn. Accurate values will be obtained for (1) orbital energies for valence shell electrons by mass spectrometric ionization potential and photoelectron spectroscopy, (2) binding energies of inner orbitals, by x-ray excitation photoelectron spectroscopy, ESCA, (3) standard heats of formation and thermochemical bond energy terms with a rotating bomb calorimeter, (4) bond dissociation energies, redistribution reaction equilibrium constants, and thermodynamic and spectroscopic parameters by nmr, nqr and magnetic circular dichroism. Experimental data will be supplemented with ab initio m.o. calculations.

Supporting agency address information: AF Office of Scientific Research NC, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0013, ELECTRON PHONON INTERACTION IN METALS AND ALLOYS
M. LEVY, Univ. of Wisconsin, School of Letters, *Milwaukee, Wisconsin* 53201 (AF-AFOSR-2079-71)

Research specifically directed toward the characterization of high transition temperature (15-25 degrees Kelvin) metallic compounds can provide a greater margin of design efficiency and operational reliability than presently available superconductors needed for application in airborne multimegawatt power generation and conditioning systems. The purpose of this investigation is to characterize by means of special ultrasonic techniques metallic films of different compositions and annealing histories. Acoustic surface waves are interacted with electrons near the surfaces of metal alloy films to determine the electron phonon interaction. Sputtered films of beta- tungsten (a-15) compounds and alloys on high dielectric substrates are studied by this technique, initially. Ultrasonic attenuation of the films is measured in magnetic fields up to 76K gauss to obtain an accurate value for the upper critical magnetic fields. The transition temperature is correlated with the electron phonon interaction in order to characterize the electronic structure and properties of these metallic compounds and alloys.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, EFFECT OF SHOCK IMPINGEMENT ON HEAT TRANSFER
J.J. GINOUX, Von Karman Inst. For Fl. Dyn., *Brussels, Belgium* (AF-AFOSR-2147-71)

In order for the AF to carry out its strategic offensive and defensive missions, improved aerospace vehicles will be required in the future which will give operational capabilities superior to those of any potential enemy. The performance of such vehicles is dependent on the engineer's ability to predict the forces, heat transfer, moments, etc., that act on the complex, three-dimensional shapes. One flow phenomenon that has been encountered in supersonic flight is that a shock from one part of the vehicle will impinge on another surface and cause heating damage. In the area of the shock impingement the interaction of the shock wave with the flow can cause dramatic changes in the heat transfer rates acting on the surface resulting in the degradation of the surface and structural materials in the vehicle. This research has been studying the heat transfer and pressure distributions in the reattachment region after the shock-boundary layer interaction zone. Measurements have been made, simultaneously, of the pressure and heat flux under steady, laminar and turbulent conditions. A joint theoretical analysis has provided very good correlation of the data. These studies will be extended to account for wall curvature effects.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0002, UNSTEADY TURBULENT FLOWS
T. CEBECI, Calif. State Univ. & Colleges, Graduate School, *Long Beach, California* 90804 (NAS 1-13656)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0003, HYPERSONIC BOUNDARY LAYER STABILITY AND TRANSITION ON A SLENDER CONE
A. DEMETRIADES, Philco Ford Corporation, *Newport Beach, California* 92663 (F44620-75-C-0016)

Blunt reentry heat shields sometimes experience unprogrammed ablative shape changes on account of unpredicted boundary layer transition. In severe cases the resulting aerodynamic disturbances cause a malfunction of the spacecraft. The process by which a laminar boundary becomes turbulent is not clearly understood. This effort proposes to analyze a unique set of hypersonic boundary layer data obtained in cone tests at AEDC by Philco-Ford. The data will be reduced and analyzed to determine the existence of hydrodynamic laminar instabilities in the pre-transitional and transitional regimes. The history of the laminar instability will be traced and the method of turbulence onset will be described in detail. The results will be compared with theoretical predictions of laminar stability theory.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0004, SUPERSONIC CO ELECTRIC-DISCHARGE LASERS
M. MITCHNER, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2050)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0005, UTILIZATION OF STAGS TO DETERMINE KNOCKDOWN FACTORS FROM MEASURED INITIAL IMPERFECTIONS
C.D. BABCOCK, Calif. Inst. of Technology, School of Engineering, *Pasadena, California* 91109 (NSG 1005)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0006, LOW COST GRAPHITE/THERMOPLASTIC SECONDARY STRUCTURE
W.F. WENNHOLD, General Dynamics Corporation, *San Diego, California* 92112 (N62269-74-C-0369)

To demonstrate and evaluate the cost savings attainable through design to low manufacturing cost by application of graphite reinforced thermoplastic composites to a representative aircraft secondary structural component. This work is in support of Work Unit HJ202, 'Development of Composite Structure for Naval Aircraft', Agency Accession No. DN133038.

The main landing gear door of the Convair Model 200 fighter was selected as the secondary aircraft structure demonstration component. The structure will be redesigned and tested and the results compared with the metal prototype design using cost and weight as the primary evaluation criteria.

Supporting agency address information: Naval Air Development Center, Air Vehicle Technology Dept. (30331), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0007, THE PADE TABLE AND RELATED AREAS OF NUMERICAL ANALYSIS

W.B. GRAGG, Univ. of California, Graduate School, *San Diego, California* 92038 (AF-AFOSR-2006-71)

The design of an effective aerospace vehicle for the AF requires the full understanding of the dynamic behavior of its component structures. These structures may be individual fuselage and wing panels or complete sections of fuselages and wings. The modes of vibration of these structures when subject to time varying loads and vibration are normally not known. Laboratory testing may provide some data at a limited number of points. The interpolation and extrapolation of the data to other points in the structure is a complicated problem even to this date. Classical techniques fail to provide accurate results in the nonlinear problems encountered. The proposed research addresses the mathematical aspects of these problems and intends to continue investigations in the following areas - (a) the numerical solution of nonlinear equations and constrained least squares problems; (b) the numerical solution of initial value problems for ordinary differential equations; (c) the Pade table and extensions. Efforts will be spent in the development of computer codes to implement an extension of a convergent modification of the secant method developed by the PI (with G. W. Stewart) and for extrapolation methods for ordinary differential equations including stiff ODE's.

Supporting agency address information: AF Office of Scientific Research NM, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0008, APPLICATION OF AUTOMATED HOLOGRAPHIC INTERFEROMETRY

B.W. HANNAH, U.S. Navy, Aerodynamics Department, *Silver Spring, Maryland* 20910

The objective of this program is the development of an automated holographic interferometry system of unique measurement capability.

The basic dual-plate holographic interferometry method, employing the recently developed reconstruction plate holder will be used. In addition, a unique interferogram projector and scanning system will be used to provide automatic reduction of the subsequent interferograms. The basic holographic interferometry system will be tested with simple (cheap) free and forced convection test cases. The only planned supersonic wind tunnel test is a validation test on a simple axisymmetric conical boundary layer.

Supporting agency address information: Naval Air Systems Command AIR-310, Department of the Navy, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0009, HIGH MACH NUMBER STABILITY AND CONTROL STUDY

W.R. LAWRENCE, U.S. Navy, Aerodynamics Department, *Silver Spring, Maryland* 20910

An examination of available data will be made relative to the yaw- plane dynamic stability degradation observed for some re-entry vehicle configurations at moderately high pitch angles of attack under hypersonic conditions. Attention will be directed toward identifying the influence of pitch trim devices on yaw-plane stability. Loss of yaw- plane dynamic and/or static stability during re-entry of lifting vehicles has serious implications relative to trajectory control and vehicle survivability. A second objective is the evaluation of the basic static-stability characteristics of typical asymmetric re-entry vehicles. The study will assess the longitudinal and directional control capability available at high Mach number and high Reynolds number flight conditions. Lastly, a theoretical investigation will be made to investigate the feasibility of employing the vehicle attitude control mechanism to provide additional dynamic stabilization by appropriate closed-loop control system techniques.

A limited experimental program is planned to obtain stability data for an asymmetric, lifting vehicle at hypersonic Mach numbers. The results will be used to define stability problem areas where imposition of control-system-induced stabilization may be needed to assure adequate vehicle performance.

Supporting agency address information: Naval Ordnance Systems Command ORD-035, Department of the Navy, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0010, THE EFFECT OF D2O ON SMALL SIGNAL GAIN IN GDLS

J.S. VAMOS, U.S. Navy, Aerodynamics Department, *Silver Spring, Maryland* 20910

The objective of this research is to assess the effects of D2O on small signal gain in CO2, N2 mixtures and to determine the effect of stagnation temperatures on small signal gain for a particular CO2, N2, D2O mixture.

A shock tunnel with a high area ratio GDL nozzle (50 to 1) will be used to simulate conditions in a GDL. Small signal gain measurements will be made in a cavity downstream of the nozzle exit.

Supporting agency address information: Naval Air Systems Command AIR-310, Department of the Navy, Washington, D.C. 20906

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0011, STUDY THE MAGNUS PHENOMENA OF A MAGNETICALLY SUSPENDED SPINNING AND CONING BODY 12209-E

E. COVERT, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DAHC04-75-C-0001)

To determine the effect of coning motion on magnus forces and moments of spinning tangent-ogive body previously tested at a constant angle of attack. This research proposal complements an MIT contract with BRL for obtaining static magnus forces and moment measurements. These programs are directly relevant to the prediction of stability and control of spin stabilized missiles and projectiles.

An experimental investigation will be carried out for a spinning ogive cylinder in coning motion with laminar flow in a wind tunnel with a magnetic balance and suspension system.

Supporting agency address information: AMC Army Research Office, Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

4.0012, VORTICITY SHEET ROLLUP INVESTIGATION

L.J. MERTAUGH, Mississippi St. University, School of Engineering, *State College, Mississippi* 39762 (F33615-74-C-3066)

Three millions of dollars are lost each year during USAF operations because of the wake turbulence hazard. The objective of this program is to investigate the wake turbulence field behind a full scale aircraft so as to develop tractable models of this vortical wake flow. The analyses developed will then be used to form advisories for purposes of reducing wake turbulence type accidents within USAF.

To conduct a near field investigation behind a full scale L-19 to determine the vortical properties of the flow associated with the rollup and formulation of the tip trailed vortices. A 6-element, hot-film, constant temperature anemometer will be used to make the velocity measurements, the anemometer is mounted to the aircraft. These measurements will be used with other data to define the rolling up process of the vorticity sheet behind the L-19 aircraft. The data will be used to develop tractable models of this vortical flow field.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0013, EVALUATION OF COMPOSITE STRUCTURES APPLICATION IN THE HARRIER V/STOL AIRCRAFT

J.C. WATSON, McDonnell Douglas Corporation, *St. Louis, Missouri* 63166 (N62269-74-C-0408)

To identify portions of the Harrier aircraft structure for conceptual design using advanced composites. To compare the cost, weight, and performance of potential composite applications, and to assess the effectiveness of viable applications on the aircraft. To define a follow-on program to incorporate high-payoff composite hardware into production aircraft. This work is in support of Work Unit HJ202, 'Development of Composite Structures for Naval Aircraft', Agency Accession No. DN133038.

Component selection will be based on potential weight and /or cost efficiency. Conceptual design layout drawings will be prepared illustrating each advanced composite configurations in sufficient detail to define design and permit design trade studies. Weight, cost/performance improvements obtained through use of composites will be compared to the Harrier aircraft baseline configuration and performance parameters. Emphasis will be placed on improved design concepts and manufacturing methods for composites which are cost-competitive with metal structures.

Supporting agency address information: Naval Air Development Center (30331), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0014, MULTIPLEX INTERIOR COMMUNICATIONS

R. FASTRING, Semcor Incorporated, *Moorestown, New Jersey* 08057 (N62269-74-C-0761)

To provide engineering support to NAVAIRDEVCEN for the definition, design, and development of the GPMS. The contract supports Work Unit DW101, Agency Accession No. DN233252.

To support NAVAIRDEVCEN in all manners of system documentation (definition-specifications-technical development plans- etc.) and technical comparisons with other types of multiplex systems relative to configuration and technology and planned aircraft usage.

Supporting agency address information: Naval Air Development Center, Aero Electronic Technology Dept. (2033), Warminster, Pennsylvania 18974

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0015, HYBRID PACKAGING OF INTEGRATED CIRCUITS

H. KAST, General Electric Company, *Cincinnati, Ohio* 45215 (F33615-74-C-2070)

Develop improved hybrid electronic microcircuit modules for hard- mounting on, and control ultimately of, gas turbine engines. The modules are to be packaged in such a way that common mechanical failures of electrical components is obviated.

This is a 30-month program in which the seven tasks will be performed: Task 1. Selection of control module, 2. Design and fabrication, 3. Procurement of IC chips, 4. Complete hybrid assembly, 5. Bench testing, 6. Engine testing, and 7. Preparation of a final technical report.

Supporting agency address information: AF Aero-Propulsion Laboratory TBC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0016, A HIGH POWER ELECTRON BEAM GENERATOR FOR FLOW VISUALIZATION AS APPLIED TO MILITARY VEHICLES TESTED IN HYPERSONIC FACILITIES

D.V. BREITENBECHER, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Ground test facilities such as the high temperature facility (HTF) are used for the development of new military flight vehicles and to advance theoretical techniques for flight performance prediction. Operational testing in ground facilities is essential to prevent technological design deficiencies of advanced ballistic missile and manned re-entry vehicle concepts. The flow and aerothermodynamic characteristics in the facility test section must be known to accurately correlate facility data with free flight performance. The objective of this Work Unit is to modify a commercial direct emission electron gun and develop the associated beam transport system so the flow patterns around models can be visually observed during facility operation.

Modification of an existing electron gun system will lower the design costs as opposed to a new development program. The gun is a standard component being originally designed for an electron beam welder operating in a high vacuum atmosphere. The major technical problem is to design an aperture and gun to be capable of maintaining a suitable vacuum in the gun chamber while permitting a maximum beam current through the facility test section. The beam handling equipment, focusing and steering, must be designed to operate in the test chamber under the influence of strong magnetic fields and at low pressure and high temperature conditions.

Supporting agency address information: AF Flight Dynamics Laboratory FXN, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0017, RESEARCH IN HIGH SPEED REACTING FLOW PHENOMENA

R.G. DUNN, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio*

AF function - electromagnetic weaponry and advanced aerospace propulsion. Deficiency - lack of fundamental data on fluid dynamic, chemical and thermodynamic processes occurring in high energy gas laser and supersonic burning ramjet flows. Research - fundamental studies of fluid dynamic, chemical kinetic, and nonequilibrium phenomena occurring in high-speed heterogeneous gas flows. How research contributes - provides improved understanding of turbulent mixing and reaction phenomena for high-speed heterogeneous gas streams in confined ducts. Research results are applicable to specific fluid dynamic problem areas in high-energy chemical and gasdynamic lasers, also to airbreathing hypersonic propulsion concepts.

Studies involving two-dimensional nozzle injection and turbulent mixing of heterogeneous gases will be made to investigate the effects of nozzle geometry, injection pressures, and flow mach numbers on simulated chemical laser flowfields. Research investigations on two gasdynamic laser concepts--the ram airbreathing laser and the mixing GDL--are also being undertaken. Experimental and numerical studies of turbulent mixing and supersonic combustion in confined hydrogen-air streams will be performed at low static pressures over wide ranges of temperature and flow velocity. Flow diagnostic measurements, appropriate to all of the above areas, include static and impact pressure, total temperature, gas sampling, and absorption spectroscopy.

Supporting agency address information: Aerospace Research Laboratory LF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0018, DEVELOPMENT OF WEAPON SYSTEM COSTING METHODOLOGY FOR AIRCRAFT AIRFRAME AND BASIC STRUCTURES

R.N. MUELLER, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Significant cost overruns during the procurement of Air Force weapon systems have pointed to the lack of adequate structural cost estimation techniques for these systems. This is an effort to develop both design-to-cost trade study and system cost estimating techniques that are sensitive to changing materials and type of construction. Costs to be estimated include RDT & E costs, acquisition costs and recurring production costs for an air vehicle airframe. When complete, this effort will provide the Air Force with the capability for improved structural cost estimation for strategic, tactical and logistic aerospace vehicles.

Various airframe structures cost models that are being developed will become operational on the AFFDL computer system. Test cases will be run on these models in order to become familiar with their operation and to check the accuracy of the model. The results of structures and materials advanced development programs will be scrutinized to determine the cost impact of these advanced technologies on aircraft airframes. The computer models will be modified to include these advanced technologies.

Supporting agency address information: AF Flight Dynamics Laboratory FBR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0019, DEVELOPMENT OF WEAPON SYSTEM WEIGHT ESTIMATION FOR AIRFRAME STRUCTURES
M.E. TALLEY, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

As new materials and structural design concepts become available for application to the design of flight vehicles, it becomes necessary to know the detailed relative weight of structure of these designs so that the impact of design options can be assessed. In order to provide an integrated analysis package that shows good correlation between structural sizing, structural weight, and structural cost, emphasis must be placed on the weight research.

Various airframe structures weight models that are being developed will become operational on the AFFDL computer system. Test cases will be run on these models in order to become familiar with their operation and to check the accuracy of the model. Also data is being developed as part of the advanced development programs which will increase the in-house weights capability when it is incorporated into these computer programs.

Supporting agency address information: AF Flight Dynamics Laboratory FBR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0020, RESEARCH ON FLUID MACHINERY
A. WENNERSTROM, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio*

AF function - aerospace propulsion, powered ground support equipment, aerodynamic ground test facilities. Deficiency - axial compressors require improvements in efficiency, flow swallowing capability and stage pressure ratio in order to reduce size, weight, complexity, and cost of turbine engines. Research - analytical and experimental evaluation of high-speed compressor design concepts and innovations. How research contributes - provides new capabilities for increasing the performance of axial type compressors and leads to reductions in size, weight, and number of parts required for turbine engines.

This effort includes creation of aerodynamic design methods and configuration innovations, design of research compressor stages, and experimental test and evaluation of these stages. Effort also includes work on new concepts or techniques of instrumentation for compressor research. Two specific problem areas now under study, first, is fully supersonic stages of extremely high pressure ratio, e.g., 3 to 1 per stage. Required efficiency about 82 percent state-of-the-art is about 76 percent. Second area is transonic stages of extremely high flow rate and relatively high pressure ratio, e.g. 40 lb/sec per sq ft frontal area at 2 to 1 pressure ratio. State-of-the-art is about 37 lb/sec per sq ft and about 1.8 to 1. The use of boundary-layer control devices within a compressor is being investigated.

Supporting agency address information: Aerospace Research Laboratory LF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0021, YUH-61A (BV) OPERATIONAL STATISTICS
S. BLEWITT, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DAAJ02-74-C-0056)

This effort will develop verfied simulation models of the Boeing Vertol Company's developmental utility tactical transport aircraft system (UTTAS) helicopter model YUH-61A in the Army's R & M and the more detailed aircraft reliability and maintainability simulation (ARMS) models, using first, inherent or design values of the R & M characteristics of the YUH-61A- and then extrapolating to the predicted R & M values of the mature aircraft system operating in and maintained by a typical Army field tactical organization. The models, data and reports will be treated as 'competition sensitive' during the period prior to selection of the UTTAS (YUH-61A or Sikorsky YUH-60A) production contractor.

This program will systematically develop five distinct models for use in UTTAS simulation analysis studies. They are- 1st: The Army's validated R & M simulation model of the USN operational twin-engined utility helicopter, the UH-1N, will be given to the contractor to be modified to the proposed UTTAS operational, support and maintenance scenarios to study the impact of the proposed O & M concepts on a wellknown operational helicopter; 2nd: Design failure rates and a 'perfect' maintenance system; and 3rd: Mature failure rates and an 'imperfect' (diagnostic errors, incorrect repairs, etc.) in the R & M model- and 4th and 5th: Design and mature versions of the arms model.

Supporting agency address information: AVSCOM Air Mobility Research and Development Laboratory, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

4.0022, MAXIMUM FLOW FUEL SERVICING SYSTEM
W. WOMER, U.S. Navy, Air Engineering Center, *Philadelphia, Pennsylvania* 19112

To outline a system that would optimize the refueling rate of any aircraft. As envisioned, the fuel fill rate in the airplane itself would generate a feedback function to maximize the flow each individual aircraft fuel system could accept.

The maximized flow, fuel replenishment system would use a pump supply capable of an output of 1000 to 1200 gpm or more, the present fuel cleaning system of filter/separator coalescer elements, fuel monitors and continuous flow fuel cleanliness monitors, bottom loading to deter static charge build-up, and would require a new three-way valve to divert the flow between the the output hose and a fuel return loop leading back from the valve to the supply tank. Based upon demand, a three-way balanced-spool type diverter valve would adjust either a full or partial fuel flow to either the aircraft refueling hose or the tank return line, continuously sensing the fuel situation in the aircraft fuel tank(s) by means of a circuit from the aircraft, electrical system connected as a part of the refueling nozzle attachment operation. The nozzle fitting used to connect the refueling hose to the airplane would be designed to include a drybreak facility and an electrical tie-in to the three-way valve.

Supporting agency address information: Naval Air Systems Command 340E, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0023, RAYLEIGH SCATTERING DIAGNOSTICS OF CONDENSATION
J. LEWIS, Aro Incorporated, *Tullahoma, Tennessee* 37389 (F40600-74-C-0001)

To experimentally determine the onset and growth properties of condensate clusters in typical exhaust flume flow fields and the dependence of the condensation process on nozzle geometry, stagnation conditions and flow composition.

Laser Rayleigh/Raman scattering, electron beam fluorescence, electron beam diffraction, static pressure measurements, and method of characteristic calculation will be used to study the onset of homogeneous condensation and the subsequent growth of clusters in nozzle produced hypersonic flows. Nozzle geometry, reservoir conditions, flow composition will be varied to condensation laws and improvement of condensation predictive techniques.

Supporting agency address information: Arnold Engineering Development Center, Arnold AFS, Tenn. 37389

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0024, GFE MODEL 35500 RECORDERS
UNKNOWN, Teledyne Geotech, *Garland, Texas* 75040 (055679 (TRAIS NO.))

The Contractor shall furnish the necessary qualified personnel facilities, materials, equipment and service. 200 disc crash recorders were produced as a pilot production run by Teledyne-Geotech under Contract DOT-HS-141-1-220 and 1000 disc recorders were produced by Teledyne Geotech under Contract DOT-HS-141-2-513. Some of the Recorders have been subjected to tests and fleet accidents. It is the purpose of this effort to refurbish the used units and mounting hardware for reuse in the recorder fleet research program.

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SUPPORTED BY U.S. Dept. of Transportation - N.H.T.S.A.

4.0025, NAVY VEHICLE DESIGN AND CONSTRUCTION - COMPUTER SIMULATION OF A VEHICLE OCCUPANT IN A CRASH ENVIRONMENT AND THERMAL STRUCTURAL RESPONSE
J.L. TOCHER, Boeing Company, *Seattle*, *Washington* 98108 (N00014-72-C-0223)

Although various thermal structural response codes are either in existence, under development, or in some stage of modification, there is an immediate need to investigate the validity of the numerical approaches and thermal-mechanical models, specifically with regard to laser induced thermal loads superimposed. Contractor will continue to investigate computer simulation of aircraft occupants in crash situations.

An investigation of thermal codes will be made with respect to stability of numerical solution schemes; accuracy and efficiency numerical solution schemes; adequacy of thermal model representation, including plasma dynamics, effects of aerodynamic forces on material removal and surface combustion; restart capability; ease of modification; and ease of access and utilization of the code.

Supporting agency address information: Office of Naval Research 474, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, SOLAR HEATING AND COOLING TECHNICAL DATA AND SYSTEMS ANALYSIS
O. CHRISTIENSEN, Univ. of Alabama, Graduate School, *Huntsville*, *Alabama* 35807 (NAS 8-31293)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0002, A STUDY OF MAGNETOSPHERIC SUBSTORMS
S. AKASOFU, Univ. of Alaska, Geophysical Institute, *Fairbanks*, *Alaska* 99701

This three-year continuing grant supports a study of magnetospheric substorms, the dynamic behavior of that region of near-earth space called the earth's magnetosphere. In the next several years it should be able to determine missing links among substorm processes which have already been found, and to uncover the sequence of processes which cause the magnetospheric substorm.

One of the most puzzling features during the magnetospheric substorms is the phenomenon called the plasma sheet thinning. Since this occurs during the expansive phase, it is diffucult to explain the whole substorm phenomena only in terms of an enhanced merging rate near the far end of the magnetotail. It has been suggested that these two apparently contradicting phenomena may be explained by supposing that a new neutral line is formed deep in the magnetotail. This group plans to investigate in great detail both the magnetic field and plasma sheet variations in the magnetotail in conjunction with auroral data taken from the Alaska meridian and elsewhere, as well as from the DAPP and ISIS-2 satellites.

The substorm is also associated with the appearance of an intense westward current along the midnight part of the auroral oval. Since it has become evident that discrete auroras are associated with an intense upward current, it is important to find the cause of enhancement of the current system which includes the electrojet. This group plans to examine relationships between field-aligned currents and the electrojet and also the geometry of the three dimensional current system.

SUPPORTED BY U.S. Natl. Science Foundation

5.0003, SOLAR 700 MHZ POLARIZATION PATROL AND HIGH-RESOLUTION OBSERVATION
P. KAUFMANN, Univ. Mackenzie, *Sao Paulo*, *Brazil* (AFAFOSR-2230-72)

AF function - solar and ionospheric forecasting. Deficiency - relationship between cause (solar disturbance and related emissions) and effects (ionospheric changes) which adversely effect communications is not understood. Research - a need exists to establish correlations between cause and effect to better predict geophysical events. How research contributes - the key in solar disturbances is the magnetic field at burst heights. Polarization measurements and especially polarization spectral data can indicate the magnetic field strength and thus aid in the interpretation of events. This must precede forecasting. For radio bursts, measurements of the degree of circular polarization will be evaluated in relation to theoretical models to identify mechanisms and to improve models. High-resolution observations of active regions in their pre-flare phase will be made. Increases in intensity or polarization can indicate changes in the magnetic field in these regions.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0004, AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA
R.N. COLWELL, Univ. of California, School of Natural Resources, *Berkeley*, *California* 94720 (NAS 9-14420)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0005, ENERGY TRANSFER REACTIONS OF ATMOSPHERIC INTEREST 11553-C
G. BLACK, Stanford Research Institute, *Menlo Park*, *California* 94025 (DAHC04-74-C-0003)

To study energy transfer reactions of electronically and vibrationally excited metastable species with atmospheric constituents. When an atmospheric application is considered, the temperature dependence of the rate coefficient will be determined. The results of this research program will be responsive to present and future requirements of the Army for information on reactions which occur in the upper atmosphere. Such information will have importance in the solution of problems resulting from the reentry of missiles such as radar blackout. It should also find application for the prediction of atmospheric effects upon ballistic missile defense systems in a nuclearly disturbed environment(nuclear redout and blackout).

Measurements will be made of the temperature dependence of the rate coefficient for the Chapman Reaction. A study will be made of the yield of vibrationally excited nitrogen in a quenching reaction.

Supporting agency address information: OCRD Army Research Office Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0006, UNSTEADY TRANSONIC AND SUPERSONIC CASCADE FLOWS
M.F. PLATZER, U.S. Navy, Postgraduate School, *Monterey*, *California* 93941

To investigate unsteady transonic and supersonic cascade flows.

The analysis of supersonic unsteady cascade flows will be based on method of characteristics solutions, the transonic flow analysis on approximate solutions of the transonic small disturbance equation.

Supporting agency address information: Naval Air Systems Command 310, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0007, FERROMAGNETIC DOMAIN DYNAMICS IN MAGNETIC GARNET MATERIALS
F.B. HUMPHREY, Calif. Inst. of Technology, School of Engineering, *Pasadena*, *California* 91109

This is the final phase of research on transient dynamic magnetic bubble and stripe domain configurations using a stroboscop-

ic sampling microscope. The microscope is capable of monitoring a single 10 nsec exposure of the dynamic state, and time sequencing of external field pulse perturbations on the equilibrium bubble or stripe domains are recorded on movie film. The observation that random yet systematic bubble shapes exist for a few microseconds after a pulse disturbance casts considerable doubt on dynamic investigations made under the assumptions that the bubble remains round. The objective of this investigation is to enhance our understanding of stripe domain wall motion, bubble collapse, dynamic conversion, bubble formation by stripe chopping, bubble translation, bubble runout, and flux reversal in perpendicular anisotropy garnet materials.

This is a renewal of NSF Grant DMR7203054.

SUPPORTED BY U.S. Natl. Science Foundation

5.0008, PROVIDE RESEARCH INFORMATION WHICH WILL BE USED IN MODELING ARCTIC IONOSPHERE

D. BROWN, Canadian Commercial Corp., *Ottawa, Ontario, Canada* (F19628-73-C-0178)

AF function - arctic communications, radar, navigation. Deficiency - the arctic ionosphere is so unpredictable that unreliabilities frequently cripple the above functions. Research - to define extensive arctic ionospheric patterns using airborne ionospheric sounder, photometers, and cameras simultaneous with ground and satellite observations. To relate these patterns to basic solar-magnetospheric- ionospheric interactions. How research contributes - the contractor will provide data which will be used for in-house research.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0009, LOW TEMPERATURE PLASMA COLLISION PARAMETERS

G.H. DUNN, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Boulder, Colorado* 80302

Recently developed techniques unique to NBS are applied to the experimental determination of electron collision cross sections for the excitation of infrared emitting levels of atmospheric molecules, e.g., CO2 and O2; the recombination of electrons and positive ions, such as O2 ion, NO ion, and H3O ion; and the excitation of extremely narrow (less than 0.005 eV) resonances in atoms, such as Ar. In addition, accurate measurements are made of cross sections for electron excitation of mercury ions and of resonance levels of atoms, such as Li and Mg. These data are used by industry and other agencies in the development and diagnosis of plasma devices.

Objectives: The objective of this project is to measure cross sections and/or rate coefficients for electron induced excitation of infrared emitting levels of atmospheric molecules, dissociative recombination of positive molecular ions, excitation of the resonance levels of metal vapors, and excitation of mercury ions and excitation of resonance states of atoms or molecules.

Motivation: The measurements to be carried out under this project are chosen to provide electron collision data required for the understanding and design of a wide variety of plasma devices, such as metal vapor lamps (industry), gas lasers (AEC and DoD) and space propulsion engines (NASA), and for understanding and predicting the behavior of natural plasmas, such as the disturbed ionosphere (DoD). This project applies the unique capabilities and newly developed techniques of NBS in the area of accurate electron collision measurements to obtain data required for improving the efficiency of lamps, increasing the output of lasers for laser fusion & defense applications, predicting the response of the ionosphere to natural disturbances or nuclear weapons & controlling the operation of developmental deep space propulsion engines.

Approach: The approach used in the excitation experiments is to measure the absolute intensity of the radiation produced as the electron energy, gas density, etc. are varied & to use the measured intensity to calculate the respective excitation cross sections. The electron- positive ion recombination determinations make use of measurements of the rate of loss of ions from a newly developed 'ion-trap'.

Progress: Progress during FY74 includes the completion of measurements of the electron-positive ion dissociative recombination cross sections for NO ion, O2 ion & H3O ion. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

5.0010, TRANSFER OF RADIATION THRU GASEOUS MEDIA

D.G. HUMMER, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Boulder, Colorado* 80302

Theories and computational procedures have been developed, and are now being tested by experiment, that make possible accurate estimates of the rate at which energy is emitted from hot gases or plasmas, that play an important role in many industrial and laboratory devices, CTR experiments, natural and nuclear atmospheric disturbances and astronomical objects. Both radiative and non-radiative mechanisms of energy transport are studied; a new general theory for these processes has been developed and applied to the analysis of experiments now underway, in which radiation for a dye laser is scattered by sodium vapor. In addition, the effect of the geometry on the radiation has been taken into account, a translation from the Russian of Ivanov's Transfer of Radiation in Spectral Lines has been published and computational techniques developed in this work have been applied to the accurate calculations of profiles in saturated-absorption spectroscopy for use in laser metrology.

Objectives: To provide general theroretical and computational procedures for relating the energy escaping from a hot gas or plasma to the internal conditions, so that the radiative energy loss rate can be estimated reliably, or alternatively, so that from measurements on the emerging radiation, the internal properties of the gas can be determined. Experimental work is directed to the determination of the effectiveness of the relevant scattering and excitation-transfer processes and to the measurement of the phenomenological quantities that enter theory, such as the distribution of radiation scattered in a collision-broadened resonance line by an atom from an incident beam of radiation.

Motivation: It is important to be able to estimate in a simple but reliable way the rate at which radiation is emitted in high pressure metal vapor lamps, proposed metal vapor lasers, electrical switch gear, CTR devices, nuclear and natural atmospheric disturbances and by vehicles in hypersonic flight. For example, in lamp design the rate at which radiant energy is produced must be maximized and the rate at which electrical energy is converted to heat must be minimized; this is possible only when the energy transport mechanisms are understood quantitatively. In many cases, it is also desirable to determine internal properties from escaping radiation, especially for CTR devices, atmospheric and astrophysical studies, and laboratory discharges. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

5.0011, ATMOSPHERIC MODELING

J.R. MCAFEE, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (8DJ42045)

Project objective: To develop comprehensive models for the upper atmosphere including chemical and dynamic effects.

Current year plan: Theoretical treatments will first be attempted on various results of the optical, radar, and neutral atmosphere groups. These should provide bases for a theoretical treatment of the upper atmosphere as a whole. This more general, time-dependent calculation should include the dynamic effects of winds, waves and diffusion and the chemical effects of neutral, ion, and photoreactions.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0012, THEORETICAL STUDIES

J.R. WAIT, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Project objective: To support J. R. Wait reserve in FY 1975 in the area of electromagnetic scattering from complex targets whose dimensions are comparable with wavelengths.

Current year plan: Upper atmosphere research, particularly with reference to scattering from hydrometers; hail particles and related targets in geophysical probing.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0013, PHOTODETACHMENT STUDIES OF MOLECULAR NEGATIVE IONS 11892-P
E.C. BEATY, Univ. of Colorado, School of Arts, *Boulder, Colorado* 80304

Study the photodissociation and photodetachment of negative ions of NO2, NO3, CO3, CO4 and their hydrates. photodetachment cross sections for negative atmospheric ions are needed to compute free electron density which affect- ionospheric communication systems (vlf, lf, mf, and hf)- ionospheric detection systems (early bird warning system)- and nuclear detonation residual effects on the atmosphere.

I. Ions produced in a relatively high pressure discharge will be allowed to reach thermal equilibrium in a vibrational sense, illuminated with a dye laser beam, and then be admitted to a quadrupole mass spectrometer for analysis. II. A relatively low pressure ion source will inject ions into a high vacuum chamber in which they are illuminated with a laser beam. Both neutral and charged fragments resulting from photodetachment or photodissociation will be detected.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0014, THE DISTRIBUTION WITH ALTITUDE IN THE STRATOSPHERE OF SEVERAL MINOR CONSTITUENTS
D.G. MURCRAY, Univ. of Denver, School of Arts, *Denver, Colorado* 80210

Part of the lack of knowledge of the photochemistry of the lower stratosphere is due to a lack of knowledge of the reaction rates. However, for many of the reactions which occur in the stratosphere, a significant part of it is due to our lack of data concerning the distribution of various minor constituents in the stratosphere. Many of these constituents are variable and since they interact it is desirable to obtain data concerning their distribution simultaneously. A number of constituents of primary interest have strong vibration-rotation absorption bands in the near infrared. It is therefore possible to obtain data concerning their distribution in the stratosphere by studying the variation of the atmospheric emission in the spectral region from 4 mu to 13 mu with altitude. This research will involve series of balloon flights using an ultrasensitive spectral radiometer system to obtain emission data of this sort. The data obtained during these flights will be analyzed and the distribution with altitude of H2O, NO2, CH4, N2O, O3, HNO3, CO and possibly NO will be determined. By making balloon flights at various times of day, seasons of the year and geographic locations it will be possible to determine the variability of the various constituents.

SUPPORTED BY U.S. Natl. Science Foundation

5.0015, HIGH LATITUDE IONOSOUNDING
N.V. JENSEN, Danske Meteorologiske Institut, *Lyngby, Denmark* (AF-AFOSR-2597-74)

AF function navigation and survivable communications. Deficiency- communications interference from natural and nuclear ionospheric disturbances. Objective - employ high resolution techniques to measure arctic propagation stability under normal and disturbed ionospheric conditions. How reseach contributes- provides the experimental information required for interpreting and modeling vlf/lf propagation. The propagation reliability of these frequencies is based on theoretical modeling for which there is only limited quantitative data, particularly for disturbed conditions. As the lower ionosphere is severely disturbed during polar cap absorption events, which occur occasionally at high latitudes, a unique opportunity is provided to investigate propagation effects. Through this research grant it will be possible to obtain the first arctic high resolution reflectivity data.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0016, AURORA OPERATIONS
P.A. CALDWELL, U.S. Army, Harry Diamond Labs., *Washington, District of Columbia* 20310

To operate and maintain the aurora facility for DNA, provide technical support to authorized users of the facility and to upgrade the simulator and the dosimetry and data-collecting capability. To investigate applications of the facility, on a time-available basis, to novel problems in simulation.

The radiation output of the simulator will be characterized and isodose contours in the exposure room constructed. Failure modes and maintenance requirements for the simulator will be established. Estimates of users' requirements for dosimetry and instrumentation support will be refined through actual support of users. EMI problems in data channels will be determined and techniques found for solving them. Problems associated with extraction of the electron beam from the simulator will be studied.

Supporting agency address information: AMC Harry Diamond Labs, AMXDO-RBH, Washington, D.C. 20438

SUPPORTED BY U.S. Dept. of Defense - Army

5.0017, RADIATION EFFECTS ON MAGNETIC BUBBLE MATERIALS
R.M. GILBERT, U.S. Army, Harry Diamond Labs., *Washington, District of Columbia* 20310

The objective of this research is the determination of radiation effects on the non-linear dynamics of domain walls in a variety of rare- earth 'magnetic bubble' garnets.

The approach entails a comparision of pre- and post-radiation response characterizations of the domain walls exposed to rf magnetic fields which are amplitude modulated at 1 KHz. Wall displacements are deduced from the associated modulation of polarized light which is faraday rotated in the film and then detected with a photomultiplier tube. The resulting signal is heterodyned and the 1 KHz information is recoved. The amplitude of this slowly varying signal is proportional to dx/dh,the differential response of the wall to the rf magnetic field. It can be graphed as a function of frequency (0.1-100 MHz) to detect resonances in the wall motion, and as a function of amplitude at given frequencies to illustrate wall velcocity saturation. Changes in these response features caused by exposure of the garnet to radiation can then be measured by direct comparison.

Supporting agency address information: AMC Harry Diamond Labs, AMXDO-RBF, Washington, D.C. 20438

SUPPORTED BY U.S. Dept. of Defense - Army

5.0018, ELECTRON SCATTERING IN GASES
R.J. CELOTTA, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234

Methods are being developed for the measurement of accurate electron impact excitation functions and differential cross sections for various gases, with emphasis on the threshold region and resonance effects. Data of this type is needed for modeling of gas discharge processes, such as those used in the xenon laser. Data is also sought on the optically forbidden states of important molecules so that upper atmospheric chemistry can be better modeled. Measurements are made as a function of scattering angle, incident energy, and energy loss, using high energy resolution electron beams. During the past year measurements were made on xenon, ozone, and NO2. The xenon and ozone measurements will be extended this year and additional molecules will be studied.

Objective: To develop measurement methods for the determination of high energy resolution excitation functions for electron impact on various atmospheric gases, with special emphasis on the threshold region and resonance effects. To measure accurate differential cross sections for electrons scattering near threshold and to provide data for optically forbidden states of important atoms and diatomic and triatomic molecules. Systems under study now, or in the near future, include ozone, xenon, mercury, CO, and COS.

Motivation: The excitation of atomic and molecular gases by low energy electrons is important for the modeling of discharge processes such as the electron excited discharge of the recent xenon laser. Current models use scanty high energy data, estimate the missing data, then make a dubious extrapolation over a wide

energy range to reach the important near-threshold region. In some cases, estimates for one gas are extrapolated to other gases. Our measurements are beginning to provide the missing data. Measurements techniques developed in our work provide benchmarks which are, and will continue to be, used by other laboratories to calibrate similar measurements on other atoms and molecules. Measurements on the excitation of optically forbidden states of diatomic and triatomic molecules give information, difficult to obtain otherwise, which is necessary to understand atom-molecule and ion-molecule reactions which are important for atmospheric photochemistry. Additionally, there is a need for optical oscillator strength measurements for simple molecular systems over a wide range of photon energies. In some cases the necessary data does not exist. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

5.0019, FLUORESCENCE SPECTRA FROM PHOTODISSOCIATION

A.H. LAUFER, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234

The object of the study is to determine the initial distribution of electronic and vibrational and rotational energy in excited fragments produced in the photodissociation of small molecules by monochromatic radiation. The measurement will be made by observing the fluorescence radiation from the excited photofragments. The rotational and vibrational distributions within a particular electronic state observed in the fluorescence spectrum will be studied as a function of incident excitation wavelength in the vacuum ultraviolet. Fluorescence lifetimes of each of several vibronic levels produced by photodissociation will be measured.

Objectives: To understand the photochemical process which requires a knowledge of the distribution of the incident photon energy among the various degrees of freedom of the dissociation fragments. This fiscal year we will complete the fabrication of the apparatus and obtain initial data.

Motivation: Knowledge derived from basic photochemistry is becoming increasingly important in solution of relevant problems involving effects of solar radiation upon matter, e.g., stratospheric chemistry, planetary atmospheres, air pollution and energy conversion. The objective, when completed, will further our understanding of photochemistry and, therefore, the areas upon which photochemistry impacts. It is important for NBS to be doing this work in order to maintain our expertise and leadership in this rapidly moving field which requires use of new experimental techniques.

Approach: Gaseous molecules will be photolyzed with monochromatic light and the fluorescence examined with a monochromator. The effect of varying the energy of the incident light upon the resulting spectral distribution of the fluorescence will be examined.

Progress: The fluorescence chamber has been completed and the required optics designed. The auxiliary vacuum system design has been finalized and the complete apparatus is in the process of final assembly. Initial generation will occur during the first quarter of FY '75.

Plans: Initial studies of the H2O system are anticipated and results should be available during this fiscal year.

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

5.0020, RESEARCH IN ATMOSPHERIC SCIENCES/AERONOMY/ATMOSPHERIC CHEMISTRY

J.M. HEIMERL, U.S. Army, Concepts Analysis Laboratory, *Aberdeen Proving Ground, Maryland* 21005

The prime technical objective is to determine and measure reaction rate coefficients and other atomic and molecular properties which occur in the upper atmosphere under conditions of (1) normal diurnal seasonal variations, (2) natural atmospheric disturbances, (3) disturbances caused by nuclear weapons, and (4) disturbances caused by missile reentry. The reaction rate coefficients and properties to be measured will be identified and their needs established by other work units. The principal reactions to be studied are those important to atmospheric ionization and atmospheric deionization. Paragraph 9 of the Army qualitative research requirements for nuclear weapons effects information (QRR) documents the requirements for this work in connection with the development of the Army BMD and other missile systems.

Experimental and theoretical work will be carried out in order to obtain the necessary information. Specific experimental facilities to be utilized are the stationary afterglow and drift tube facilities. Both facilities have been utilized to study ion-neutral reactions.

Supporting agency address information: AMC Ballistic Research Labs, Aberdeen Proving Ground, Md. 21005

SUPPORTED BY U.S. Dept. of Defense - Army

5.0021, STRATOSPHERIC MEASUREMENTS OF PARTICULATES

H.A. MIRANDA, Epsilon Laboratories Inc., *Bedford, Massachusetts* (F19628-75-C-0004)

AF function - reconnaissance, communications, surveillance, guidance, target acquisition and tracking. Deficiency - the performance of optical systems observing through the atmosphere is significantly degraded by light scattering and absorption and is a variable complex function of the atmosphere in the theatre of operation. Research - balloon measurements of atmospheric haze, particle concentration and size, up to 30 km altitude. How research contributes - these experiments will provide direct measurements of atmospheric input parameters for computer programs utilized for the prediction and analysis of atmospheric optical effects on various optical and electro-optical systems under operational use. Novel devices have been designed, fabricated, and flown to measure the size distribution and concentration of haze particles from ground level to 30 km altitude. Results from these flights will provide direct input data needed for evaluating the accuracy of theoretical computational methods on light transport. Such theoretical programs are important for the calculation of atmospheric optical effects on specific electro-optical systems under given operating conditions.

Balloon-borne aerosol counter - this instrument will receive final calibration in preparation for two balloon flights at Chico, California, tentatively scheduled for November 1974. Data obtained from these flights will be reduced, analyzed and published. Airborne aerosol particle counter - this instrument, constructed by GCA Corp. under contract F19628-72-C-0384, will be studied and modified to meet the technical performance standards by the balloon-borne device.

Supporting agency address information: AF Cambridge Research Laboratories OP, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0022, POLAR CAP INFRARED MEASUREMENTS

W.N. HALL, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - surveillance and detection. Deficiency - in-situ polar cap infra-red measurements are not available to verify systems design concepts. Research - measurement of optical spectral intensities in the polar cap. How research contributes - investigates pressure dependence of nitrogen band emissions in the visual and near infrared spectrum. A scanning spectrometer with digital recording system will measure atmospheric optical emissions in the visual and near infrared. A suitable scanning system will permit averaging of scans and pulse counting will be used to improve detection of weak signals. The location of the instrument at 88 degrees geomagnetic latitude at Thule AFB, Greenland will permit the optical emissions produced by energetic solar protons to be separated from emissions produced by auroral electrons to investigate pressure effects on excitation efficiencies.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0023, POLAR IONOSPHERE WIND EFFECTS

R.C. SAGALYN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - missile detection, satellite tracking as well as general surveillance in the polar regions. Deficiency - irregularities, troughs and gradients in electron density distribution produced in part by polar ionospheric winds introduce significant errors in satellite and missile tracking systems. Lack of knowledge of the magnitude and density of polar winds at high latitudes limits the interpretation and applicability of ion attitude sensors. Research - instruments will be developed to measure bulk ion motion by means of polar orbiting satellites in and above the F region of the ionosphere. The technique of measurement is similar to that of the ion attitude sensor developed and successfully flown on the Gemini Spacecraft X and XII. The LDF supported instrumentation is scheduled to be flown on the Air Force satellite STP 3-2. The analysis will focus on bulk ion flow measurements, the polar winds, obtained at and above auroral zone latitudes. How research contributes - bulk ion motions directed nearly along magnetic field lines of force at high latitudes, i.e. the polar wind, produce large gradients and irregularities in the ion and electron density distribution in these regions. The resulting spatial variations are the source of large uncertainties in missile location and tracking. The determination of the magnitude and behavior of the polar wind under greatly varying geophysical conditions will contribute significantly to the establishment of electron density models required for detection and surveillance systems operating in the Arctic regions.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0024, HIGH ALTITUDE OPTICAL SCATTERING

R. TOOLIN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - target acquisition and tracking, guidance, reconnaissance, surveillance, communications. Deficiency - the performance of optical systems, active or passive, observing through the atmosphere is significantly degraded by light scattering and absorption and is a variable complex function of the atmosphere in the theatre of operation. Research - aircraft measurements of atmospheric particulates in size and concentration up to 65,000 feet altitude. How research contributes - provides direct measurements of the atmospheric input parameters for computer programs being utilized for the prediction and analysis of stratospheric optical effects on light sources and various electro-optical systems under operational use. The role of stratospheric particulates in signal degradation or in off-axis covert detection of optical signals is significant. This RB-57F aircraft flight program is confirmed to obtain direct measurements of the size and concentration of the stratospheric particulates. Results will provide direct input required for evaluation of airborne systems being developed for a variety of USAF functions.

Supporting agency address information: AF Cambridge Research Laboratories OP, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0025, INVESTIGATE MAGNETIC FIELD PHENOMENA IN THE IONOSPHERE

J.F. DEVANE, Boston College, School of Arts, *Chestnut Hill, Massachusetts* 02167 (F19628-74-C-0003)

AF function - operation of communications, navigation, and detection systems in high latitudes. Deficiency - magnetic substorms cause degradation and false signals. Research - rocket launched fields and particle sensors and ground based data collection platforms provide data from which disturbances can be studied. How research contributes - predictions of event time and severity will reduce possibility of false alarms and permit alternate procedures. The disturbance to the geomagnetic field during a storm and the mechanisms which accelerate charged particles in the magnetosphere or ionosphere to energies which produce auroral phenomena are principal problems in the development of theoretical models. This work will investigate the magnetic field and its perturbations during a disturbance and is part of the overall program to evaluate models of auroral region activity.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0026, GLOBAL IONOSPHERIC MODEL

D. MILLER, Arcon Corporation, *Wakefield, Massachusetts* 48226 (F19628-74-C-0070)

AF function - ionospheric modelling. Deficiency - inability to forecast and specify the ionosphere causes serious degradation to HF communication and detection systems. Research - develop a global ionospheric model using routinely observed geophysical parameters. How research contributes - this research will permit the development of a global model of the ionospheric electron density applicable for any instant of time. Use will be made of observed parameters that are indicative of the ionization structure. Although observed at specific locations, these parameters are extended to unobservable region by use of synoptic mapping techniques. The resulting model will be three dimensional in nature and when tied to ray-tracing programs will be directed applicable to post analysis and real-time frequency management of HF radio propagation systems.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0027, ION VELOCITY DISTRIBUTIONS IN THE AURORAL IONOSPHERE

P.B. HAYS, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106

The ion velocity distribution in the ionosphere will be investigated. It has been found that the distribution departs from a Maxwellian in situations where neutral winds or electric fields are sufficiently large. This finding is of importance in the interpretation of incoherent backscatter measurements, optical Doppler profiles, and retarding potential analyzer measurements in the lower ionosphere. The theoretical aspects will be extended and the application to the above ionospheric effects will be investigated.

SUPPORTED BY U.S. Natl. Science Foundation

5.0028, EXCITATION STUDIES AND MASS SPECTROMETRY OF PLASMAS

J.W. DETTMER, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio*

AF function - communication, weaponry, illumination. R.F. effect in communications, nuclear weapons effects. Deficiency - lack of knowledge on excitation, ionization and dissociation processes in gas discharge lasers and the upper atmosphere especially under energetic conditions. Research - mass analysis of gas discharges relevant to molecular gas discharge lasers. Direct and cumulative excitation cross- sections. How research contributes - improved gas discharge laser systems and improved understanding of atmospheric processes.

A modulated molecular beam mass spectrometer is used to monitor the relative and absolute concentrations of various molecular species existing in typical laser plasmas. Neutral, ionic, and reactive species are measured under carefully defined plasma conditions. Time resolved observations of the species concentrations allows direct analysis of dissociation and association rates. Phase sensitive detection of the modulated beam and use of a low energy, efficient ionizer assures unambiguous measurement of the true plasma ions and neutral concentrations. Direct and cumulative excitations of atomic and molecular gases are measured using a dual electron beam system interacting with a molecular beam. A high speed pumping system allows measurement of these cross-sections in dissociating gases. Photon counting, synchronous detection, and sophisticated digital data handling techniques are used to obtain and analyze reliable data. A low energy electron analyzer permits direct measurement of elastic and inelastic scattering of electrons by atoms and molecules. This instrument has a resolution of better than 0.03 EV and is capable of resolving reso-

nant states of atoms and molecules. Data from these experiments is used to improve existing theoretical models of non-equilibrium plasmas and to aid in the analysis of the plasma properties of discharge lasers. Direct and cumulative excitation and ionization measurements lead to a better understanding of the effects of natural and man-made ionospheric disturbances.

Supporting agency address information: Aerospace Research Laboratory LU, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0029, SURVEILLANCE - ATOMSPHERIC OPTICAL SCATTERING

M.A. BIONDI, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (N00014-67-A-0402-0010)

A knowledge of the optical background in the upper atmosphere is important for optical surveillance and satellite communications. The objective of this study is to measure the optical background and determine the nature of particulate matter in the upper atmosphere.

The optical background has been measured by a photometer in a satellite. This data obtained must be analyzed to determine the effect of latitude. A sensitive particle collector and analyzer is being designed to be mounted on a rocket. This analyzer will be used to measure particle size and concentration in the upper atmosphere.

Supporting agency address information: Office of Naval Research 421, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0030, ATOMIC AND MOLECULAR PROCESSES IN ATMOSPHERIC ENVIRONMENTS 11427-P

T.M. DONAHUE, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213 (DAHC04-73-C-0037)

To study the composition of the mesosphere and lower thermosphere by using optics, plume physics. The natural and distrubed IR and visual radiation in the upper atmosphere and in the wakes may be very different over southern polar regions. The daylit 'noctilucent clouds' may be an important source of noise in the summer polar sky above 75 deg. latitude.

An important discovery with the OGO-6 photometer is a dense but geometrically thin layer of aerosols which develops near the summer polar mesopause. This is an extension of noctilucent clouds into the daylit polar atmosphere where they are about 50-100 times as thick optically. These aerosols could be strong IR emitters. Plans are to develop techniques for further study of these layers.

Supporting agency address information: AMC Army Research Office ARO-D, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0031, THE PRODUCTION, RELAXATION, AND DISSOCIATIVE RECOMBINATION OF VIBRATIONALLY EXCITED IONS OF AERONOMIC IMPORTANCE

E.C. ZIPF, Univ. of Pittsburgh, School of Arts, *Pittsburgh, Pennsylvania* 15213

A new technique involving the use of high intensity, pulsed dye lasers will be used to measure directly the rotational and vibrational populations of ions in a plasma. This information is required in order to obtain rate coefficients for reactions of aeronomic importance involving N2 ion, NO ion, O2 ion and CO2 ion, ions in dissociative recombination under conditions that prevail in the earth's ionosphere and on other planets. It has long been suspected that laboratory conditions do not properly simulate real planetary atmospheres, casting doubts on the applicability of certain rate coefficients. This investigation will attempt to resolve some outstanding problems in aeronomy related to distributions of populations in excited states.

SUPPORTED BY U.S. Natl. Science Foundation

5.0032, TURBULENCE CHARACTERISTICS IN THE STRATOSPHERE

H.A. PANOFSKY, Penn. State University, School of Earth Sciences, *University Park, Pennsylvania* 16802

The objective of the proposed research is to use all available project HICAT records to estimate stress and exchange coefficients of momentum and heat in the lower stratosphere, as a function of season, terrain, and possibly other parameters. The method will be to derive heat and momentum fluxes directly from the velocity and temperature fluctuations recorded on the tapes. Exchange coefficients will be calculated by dividing fluxes by mean gradients. Dissipation will be estimated from the spectra of velocity components in the inertial range.

SUPPORTED BY U.S. Natl. Science Foundation

5.0033, AGARD NAB STUDY

L.L. GALLIGHER, Aro Incorporated, *Tullahoma, Tennessee* 37389 (F40600-74-C-0001)

Investigate various problems and test techniques associated with integrated nozzle-afterbody testing in transonic wind tunnels.

Provide a data base from which an evaluation can be made of the test techniques currently used to determine the performance of integrated airframe-propulsion systems. Based on this evaluation, new procedures can be initiated where needed to improve the wind tunnel test capability. In addition, the results of this project will provide a means of identifying influences of wind tunnel generated disturbances on test data.

Supporting agency address information: Arnold Engineering Development Center, Arnold AFS, Tn. 37389

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0034, DEVELOPMENT OF LOW-COST THIN FILM POLYCRYSTALLINE SILICON SOLAR CELLS FOR TERRESTRIAL APPLICATIONS

T.L. CHU, Southern Methodist University, Electronic Sciences Center, *Dallas, Texas* 75222

This research is for the second eighteen (18) month period of a project on the preparation of low-cost thin film polycrystalline silicon solar cells suitable for large-scale terrestrial utilization. The principle objectives are: (1) The deposition, characterization, and optimization of silicon p-n junction structures on metallurgical-grade silicon and graphite substrates, (2) Purification of metallurgical-grade silicon and fabrication of substrates from the purified silicon, (3) Fabrication and characterization of solar cells from silicon crystals pulled from purified metallurgical-grade silicon, and (4) The fabrication and characterization of large area solar cells, 30 cm2 or larger in area.

SUPPORTED BY U.S. Natl. Science Foundation

5.0035, A CRITICAL SURVEY OF SPHERE DRAG IN THE TRANSITION FROM CONTINUUM TO FREE MOLECULAR FLOW

C.L. BRUNDIN, Univ. of Oxford, *Oxford, England, United Kingdom* (AF-AFOSR-2567-73)

AF function - (1) design of aerospace vehicles for operation in the upper atmosphere. (2) discrimination and identification of reentering objects from telemetry data. Deficiency - in order to accomplish the above functions, the Air Force must know how the drag of an object varies with speed, altitude, and surface temperature. Even for the very simplest geometry (the sphere), such knowledge is incomplete, especially in the transition region between free-molecular and continuum flows. Not only is there no satisfactory theory, but even empirical formulas fail to correlate available data or account for the temperature effects. Research - comprehensive search and analysis of literature and data bearing on the drag of a sphere, followed by measurements in the Oxford low density wind tunnel as necessary. All attempts will be made to determine the governing non-dimensional parameters so that data can be correlated and sound theory can be formulated which will enable extrapolation to other shapes and conditions to be carried out. How research contributes - research is aimed at providing the vital link between experimentation and prediction/identification.

A detailed study of all available sphere drag data will be conducted. The aim of this study is the evaluation, analysis, and correlation of the data in terms of the relevant physical parameters.

the study will include data from a current experimental study at Oxford University of the effect of surface temperature on sphere drag in supersonic transition flow, this being the major area of uncertainty still in existence. The experiments are being done with an accurate magnetic suspension system under carefully defined flow conditions, and the data are believed to be very reliable.

Supporting agency address information: European OFC of Aerospace Rsch. and Dvlpmt. NRE, FPO New York 09510

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0036, NAVY ENVIRONMENT - STRATOSPHERIC TRACE GASES
T.J. PEPIN, Univ. of Wyoming, School of Arts, *Laramie, Wyoming* 82070 (N00014-70-A-0266-0009)

The continuing objective of this effort is to determine reference levels of trace gases in the stratosphere for the purpose of determining the environmental impact of Navy high performance aircraft on the stratosphere. Specifically, this research studies the applicability of solar extinction methods in the infrared region.

Feasibility of utilizing a solar extinction measuring device (previously developed to measure aerosols), coupled with a pointing device (to be designed), to operate in the infrared region of the spectrum (2.5-14 micron) in order to measure the concentration of trace gases in the stratosphere will be pursued. Testing of a solar 'lock-on' pointing system and the optical instrumentation associated with the extinction experiment will be accomplished utilizing at least two balloon flights.

Supporting agency address information: Office of Naval Research 466, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, AGRICULTURE INTERPRETATIVE TECHNIQUE DEVELOPMENT USING SKYLAB/EREP DATA
R.N. COLWELL, Univ. of California, School of Natural Resources, *Berkeley, California* 94720 (NAS 9-14419)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0002, STUDY OF BLOOD INSULIN-BINDING
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NAS 2-8513)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0003, MODELING OF WHEAT SIGNATURES FOR SIGNATURE EXTENSION
J.A. SMITH, Colorado State University, School of Natural Sciences, *Fort Collins, Colorado* 80521 (NAS 9-14467)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0004, EVALUATION OF DUAL ISOTOPE FLUORESCENCE FOR MONITORING CO IN HYPERBARIC ATMOSPHERES
L.M. FRASER, U.S. Navy, Medical Research Inst., *Bethesda, Maryland* 20014

Endogenous carbon monoxide formation by crew members in closed spaces (saturation diving habitats, hyperbaric training chambers, submersibles) leads to the accumulation of CO (carbon monoxide) in the environmental gas as well as the blood of the crew members. In addition, CO may be formed by the operation of the life support system, by degradation of environmental materials, or biologically by seaweeds and animals. CO can be measured by simple chemical and/or physical methods only at high levels. Nondispersive infrared analysis (NDIR) has been used extensively, but is not portable and requires much care to obtain meaningful results. The object of this project is to evaluate the use of dual isotope fluorescence infrared spectrometry (DIF-IR) for monitoring carbon monoxide in hyperbaric air and helium-oxygen atmospheres. DIF-IR uses the fluorescence of a mixture of 12CO and 13CO as the light source for conventional NDIR analysis.

This project will be carried out in two stages: phase I will involve purchase and modification of a commercial dual isotope fluorescence infrared analyzer so that the sample compartment can withstand the maximum pressures forseeable (100 atm/1500 psi). Phase II will involve evaluation of this modified instrument in terms of sensitivity, selectivity and stability, both at 1 atm with air and 80 percent helium-20 percent oxygen and at hyperbaric pressures in normoxic helium-oxygen mixtures.

Supporting agency address information: Naval Medical Research Institute, Bethesda, Md. 20014

SUPPORTED BY U.S. Dept. of Defense - Navy

6.0005, MAN BREATHING SIMULATOR ALTITUDE MODIFICATION
J.P. ALLEN, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Oxygen regulators for aircrew members deliver an excessive amount of oxygen in the diluter mode between sea level and 28,000 feet cabin altitude. A need exists to accurately assess the adequacy of new regulator designs intended for more precise regulation of oxygen. No simulated capability exists to satisfy this need. The objective of this effort is to modify an existing manned breathing simulator to achieve altitude characteristics. The payoff will be reduction in manned testing on regulators during early development stages and a capability for assessing design modifications throughout the operational range.

Components will be analyzed for loads, stresses, etc. Under varying pressure conditions and new designs prepared, parts fabricated and the system evaluated in an existing space chamber at various altitudes. Operational limits and accuracy of simulation will be established for the modified manned breathing simulator, with results described in a report.

Supporting agency address information: AF Flight Dynamics Laboratory FEE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0006, MAN-MODEL UPGRADE
J.P. HULL, U.S. Air Force, Aerospace Med. Res. Lab., *Dayton, Ohio* 45433

To couple human operator models with the P001 attrition model. Specifically, to develop the human operator controller and doctrine models and integrate them into P001. Interested users- studies and analysis, USAF, and joint aircraft attrition panel.

Using data from man-in-the-loop simulation conducted at AMRL/EM and field test data when available, the models will be identified and validated. The P001 will be improved and analysis using the improved P001 will be used for experimental design and analysis.

Supporting agency address information: 6570 Aerospace Medical Rsch. Lab EM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0007, PILOT PERFORMANCE MEASUREMENT RESEARCH RESULTS
P.A. KNOOP, U.S. Air Force, Human Resources Laboratory, *Dayton, Ohio* 45433

The purpose is to demonstrate and document the results of two performance measurement efforts conducted under contracts F33615-72-C- 2028 and F33615-72-C-2094. These contracts were originally designed to derive and validate T-37 pilot performance measures using data recorded on an instrumented T-37 aircraft. However, non-technical problems prevented collection of the data as planned. The present effort is to generalize the techniques where possible to insure maximum utility, and to

demonstrate their validity to the extent feasible without the availability of T-37 data.

The approach is to review the contractor's draft reports of the work performed and select for final documentation the techniques that can be demonstrated without additional T-37 data. Demonstration of these techniques will be accomplished to the extent possible using data from the Simulation and Training Advanced Research System (STARS). Technical reports will be written on the selected techniques, and attempts will be made to generalize their applicability beyond the originally intended T- 37 application.

Supporting agency address information: AF Human Resources Laboratory ASM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, COMPUTER MODEL SIMULATION OF THE EFFECTS OF ELECTROMAGNETIC INTERFERENCE
O.R. AINSWORTH, Univ. of Alabama, School of Arts, *Tuscaloosa, Alabama* 35486 (NAS 8-30886)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0002, MATHEMATICAL EVALUATION AND REVIEWING SERVICES
T.A. BOTTS, Conf. Board of the Math. Sci., *Washington, District of Columbia* 20037 (F44620-70-C-0062)

The AFOSR is assigned the mission of supporting programs of research in universities and industry designed to provide new scientific knowledge and understanding in those areas of science which offer the greatest potential for improving the Air Force's present and future operational capability. Research in the critical areas of information sciences, control theory, and probability and statistics under project 9769 and in the equally critical areas of physical mathematics, numerical analysis, and system science under project 9749 is the specific responsibility of AFOSR's Directorate of Mathematical and Information Sciences. This work unit provides that Directorate with in- depth and expert scientific evaluation of proposals and related advisory services, thereby, insuring support only of those research programs of the highest scientific quality. These services coupled with the scientific and relevancy assessments made by the AFOSR program managers for these areas and the frequent assistance of selected Air Force laboratory personnel make up a meaningful and balanced work unit selection procedure in the mathematical and information sciences which enhances the overall contribution made by AFOSR in advancing the technology base on which the effective and efficient planning, RDT and E, and operation of aerospace systems depend.

Supporting agency address information: AF Office of Scientific Research NM, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, TECHNICAL EVALUATION AND DEVELOPMENT OF THE ION PROBE
G. WASSERBURG, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NSG 7084)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0002, STUDY NEUTRONS AND GAMMA RAYS FROM THE SUN
R.S. WHITE, Univ. of California, School of Physical Sciences, *Riverside, California* 92502

This grant supports the research on solar gamma rays and neutrons using a balloon-borne detector which uses the double scatter technique. The detector telescope measures 2-100 MeV neutrons and 0.5-30 MeV photons. This grant supports the completion of construction of the detector, the calibration using Van de Graaf accelerators, and the initial flight of the payload.

SUPPORTED BY U.S. Natl. Science Foundation

8.0003, ASTP EXPERIMENT AR002
E.V. BENTON, Univ. of San Francisco, School of Science, *San Francisco, California* 94117 (NAS 9-14396)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0004, SUPERCONDUCTIVITY IN NONSTOICHIOMETRIC COMPOUND
M.J. SIENKO, Cornell University, School of Arts, *Ithaca, New York* 14850 (AF-AFOSR-2583-74)

High temperature superconducting materials are needed for application in airborne multimegawatt power generation and conditioning systems. Research specifically directed toward the synthesis and characterization of high transition temperature metallic compounds can provide a greater margin of design efficiency and operational reliability than presently available superconductors. The performance of high field magnets and solenoids, electric motor windings, superconducting rotors in power generators, transformers and induction energy storage systems could be significantly improved if the upper critical field, the current-carrying capacity and the critical transition temperature of the superconducting material could be enhanced. This investigation is specifically directed at elucidating the principles for designing new compound superconductors based on wide departures from conventional stoichiometry. Primary emphasis is given to tunnel-like and layer-like compounds in which conditions for electron- atom vibration coupling is particularly favored. The approach is to prepare new materials in which the composition can be varied by departure from stoichiometry, measure the critical temperature and critical field for passage into the superconducting state, and determine how these can be maximized as functions of composition. Three systems are under study, namely, tunnel structure tungsten oxide bronzes, layered type transition metal disulfides and diselenides, and metal- atom-cluster compounds. Structure changes are monitored by x-ray measurements and physical property studies. Critical temperature vs. critical field relations are fixed by flux-expulsion and thermal- relaxation techniques. The role of localized moments and structural defects in breaking up superconducting pairs is investigated.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, LEGAL ASPECTS OF REMOTE SENSING TECHNOLOGY
UNKNOWN, Univ. of California, Graduate School, *Berkeley, California* 94720 (NGA 2-50502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, OPTICAL EMISSIONS FROM PLANETARY ATMOSPHERES
G.G. SIVJEE, Univ. of Alaska, School of Arts, *Fairbanks, Alaska* 99701 (NSG 2053)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0002, REMOUNTING OF NASA 60 INCH TELESCOPE LOCATED AT MOUNT LEMMON
C.P. SONETT, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NAS 8-31188)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0003, PHOTOMETRIC OBSERVATIONS BETWEEN 2 AND 35 MICRONS FROM C-141
N. WOOLF, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NSG 2042)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0004, SPECTROSCOPY OF COSMIC X-RAY SOURCES AND OF THE SOLAR CORONA
A.B. WALKER, Stanford University, Graduate School, *Palo Alto, California* 94305 (NSG 2049)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0005, STRUCTURE AND ENERGY BALANCE OF CORONAL ACTIVE REGIONS
A.B. WALKER, Stanford University, Graduate School, *Palo Alto, California* 94305 (NSG 7099)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0006, RELATION OF THE OBSERVED FAR ULTRAVIOLET SOLAR IRRADIANCE TO THE MAGNETIC SECTOR STRUCTURE
J.M. WILCOX, Stanford University, Graduate School, *Palo Alto, California* 94305 (NSG 5024)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0007, PETROLOGIC AND MICROPROBE INVESTIGATIONS ON ISOTOPICALLY-DATED LUNAR SAMPLES
A.L. ALBEE, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NGL 05-002-338)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0008, SHOCK COMPRESSION MEASUREMENTS ON LUNAR SAMPLES
R.O. HARGER, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NSG 9019)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0009, REDUCTION OF MARINER 71 INFRARED RADIOMETER DATA
G. NEUGEBAUER, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NSG 7094)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0010, EVOLUTION OF THE SMALL BODIES IN THE SOLAR SYSTEM
H. ALFVEN, Univ. of California, Graduate School, *San Diego, California* 92038 (NSG 7102)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0011, INFRARED CONTINUUM OBSERVATIONS OF SOLAR ATMOSPHERIC STRUCTURE
H.S. HUDSON, Univ. of California, Graduate School, *San Diego, California* 92038 (NSG 7100)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0012, REMANENT MAGNETIZATION OF LUNAR SAMPLES
M.O. FULLER, Univ. of California, Graduate School, *Santa Barbara, California* 93106 (NSG 9020)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0013, DATA ACQUISITION
C.E. HOMBACK, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Research/service objective: In support of the work on the solar- terrestrial environment model, this program provides consulting and programming services in the areas of numerical analysis and computer utilization.

Research/service plan: Services as needed, will be provided to the various program areas.

Progress report: Data reduction and consulting have been provided for eight different satellite experiments. A real time satellite data acquisition and archiving system has been procured and is being programmed to support four geostationary satellite programs, which will have experiments aboard designed by Laboratory staff members.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

10.0014, COSMIC RAY MODULATION, SOLAR PHYSICS, AND THE INTERPLANETARY MEDIUM
R.L. CHASSON, Univ. of Denver, School of Arts, *Denver, Colorado* 80210

This grant provides funds to study the effects of the plasma-magnetic field environment on cosmic rays as reflected in cosmic ray mesons. Attempts will be made to correlate measured solar parameters (such as the intensity of certain spectral lines) with the cosmic ray meson flux. Solar and sidereal day variations will be investigated and the Forbush predecrease phenomenon examined. The techniques are applicable to the region away from the plane of the ecliptic, a region not now open to satellites.

SUPPORTED BY U.S. Natl. Science Foundation

10.0015, UV SPECTRA OF TRANSIENT MOLECULAR SPECIES
A.M. BASS, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234

Electronic spectra of small molecules are studied in order to characterize the energy states and the structural parameters of these molecules, and in order to determine the chemical reactivity of excited species and free radicals. These measurements are needed for an understanding of the compositions and chemistry of the atmospheres of the earth and other planets. The experimental techniques that are applied include vacuum ultraviolet spectroscopy, flash photolysis, fluorescence of excited states, and gas chromatography.

Objectives: This project is directed toward the characterization of the energy states and chemical reactivity of small molecules and radicals which are important in the physical and chemical structures of the atmospheres of the earth and the other planets in our solar system. The long range objectives sought are (1) measurement of rate constants of reactions of importance in

planetary atmospheres; (2) measurement of energy distributions of product species formed in the photodissociation of molecular species present in planetary atmospheres; (3) measurement and analysis of the spectra of small molecules and radicals of importance in planetary atmospheres. Current objectives are: (1) completion of the ongoing study of the reactivity of the methyl (CH_3) and methylene (CH_2) radicals; (2) assembling and making operational the fluorescence apparatus for the study of the distribution of energy in photodissociation products; (3) completion of the measurement of the extinction coefficients of nitrogen dioxide (NO_2) in the near ultraviolet, as a function of temperature.

Motivation: These measurements are essential to the understanding of the compositions, structures, and chemistry of the atmospheres of the planets. In addition to providing the basic description of the nature of the atmosphere, these data are needed to assess the effect of perturbation on the atmosphere. For example the Department of Transportation and NASA are concerned about the effect upon the earth's atmosphere produced by engine exhausts from high altitude craft.

Approach: Molecular species of interest are produced in a variety of environments which are appropriate for the observation of the species and their chemical reactivities. The techniques that are applied include gas phase flash photolysis in the vacuum ultraviolet in conjunction with time-resolved spectroscopy and gas chromatography. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

10.0016, SOLAR MAGNETIC AND VELOCITY CINEMATOGRAPHY

J.M. BECKERS, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - communications, detection, tracking. Deficiency - inadequate precision of predictions of damaging sun induced geophysical disturbances. Research - optical studies of solar activity. How research contributes - provides new data on the evolution of solar magnetic fields and mass motions near sunspots. To provide the Sacramento Peak Observatory with equipment required to make time lapse motion pictures of magnetic fields and sightline mass motions in the sun. The important advance expected of the proposed system is the ability to produce movies or still photographs that are direct pictures of the solar magnetic or velocity fields, exhibiting the full spatial resolving power of the Sacramento Peak Tower telescope and any desired time resolution down to a fraction of a second. The gain in time resolution expected with this system will solve many of the crucial questions of fact now confronting the theories of the physics of solar activity, flares in particular.

Supporting agency address information: AF Cambridge Research Laboratories LM, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0017, STUDY OF THE PLASMA SHEET AT LUNAR DISTANCES

J.W. FREEMAN, Rice University, School of Humanities, *Houston, Texas* 77001

Low energy positive ions in the geomagnetic tail will be studied by analyzing measurements obtained from the Suprathermal Ion Detecter Experiment deployed with the Apollo 12,14 and 15 Lunar Surface Experiment Packages. A new class of particles of energy around 100 eV has been observed in the vicinity of the plasma sheet. These particles appear to be correlated with geomagnetic activity and to exist in the same general region of space as the plasma sheet.

SUPPORTED BY U.S. Natl. Science Foundation

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N75-16504*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

STATIC TESTS OF A SIMULATED UPPER SURFACE BLOWN JET-FLAP CONFIGURATION UTILIZING A FULL-SIZE TURBOFAN ENGINE

James P. Shivers and Charles C. Smith, Jr. Washington Feb. 1975 41 p

(NASA-TN-D-7816; L-9712) Avail: NTIS HC $3.75 CSCL 01A

The investigation utilizing a small turbofan engine was conducted to evaluate static turning performance and pressure and temperature environment of an upper surface blown wing and flap segment. The tests involved modifications of the engine primary nozzle to alleviate high-temperature problems on the wing and flaps without adversely affecting static turning performance over the desired range of flap deflection and thrust condition. Author

N75-16505# European Space Research Organization, Paris (France).

A CONTRIBUTION TO THE NONLINEAR LIFT AND PITCHING MOMENT PROPERTIES OF SLIM WING-BODY COMBINATIONS

Horst Otto Oct. 1974 70 p refs Transl. into ENGLISH of Ein Beitr. zu den nichtlinearen Auftriebs- u. Nickmomenteneigenschaften von schlanken Fluegel-Rumpf-Kombinationen, DLR-FB-73-66, DFVLR, 12 Apr. 1973

(ESRO-TT-101; DLR-FB-73-66) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 15.50 DM

The nonlinear aerodynamic properties of slender wing-body combinations in incompressible flow were studied by means of three component measurements and flow investigations. In these tests the wings were located at the center line of the fuselages and their rear position was altered in a wide range. Considering the most important nonlinear influences determined from these experiments, the linear wing-body theory after X. HAFER is extended to the calculation of the nonlinear lift and pitching moment coefficients of slender wing-body combinations. In this approach the wing is represented by a vortex model consisting of a vortex sheet, which is bent off at the trailing edge of the wing, as well as by the vortex model of the nonlinear lifting surface theory of K. GERSTEN. The results of sample calculations, carried out for slender wing-body combinations at different rear positions of the wings with respect to the fuselages, are compared with experimental results. Author (ESRO)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N75-16506 British Library Lending Div., Boston Spa (England).

THE VIBRATIONS OF A CYLINDER IN THE WAKE OF ANOTHER. ANALYSIS OF THE PHENOMENA WITH AN ANALYTICAL MODEL

G. Diana and F. Giordana 30 Oct. 1973 29 p refs Transl. into ENGLISH from Energia Elettrica (Italy), no. 7, 1972 p 448-457

(BLL-CE-Trans-6185-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

A mathematical model is proposed which enables the principal characteristics of the phenomenon of vibrations induced by the wake effect to be demonstrated. The analysis conducted on this model makes it possible to determine the range of wind velocity which gives rise to instabilities of the flutter type and formulae for practical application are presented. A method for estimating the damping required to prevent the phenomenon arising is also proposed. Some numerical results are given relating to the case of bundles of conductors with sub-conductor spacings presently in use. Author

N75-16507*# Marshall Industries, Irvine, Calif.

ATTITUDE DETERMINATION OF A HIGH ALTITUDE BALLOON SYSTEM. PART 1: DEVELOPMENT OF THE MATHEMATICAL MODEL

N. J. Nigro, A. F. Elkouh, K. S. Shen, P. Nimityongskul, V. N. Jhaveri, and Aj Sethi [1975] 74 p refs

(Grant NsG-1025)

(NASA-CR-142193) Avail: NTIS HC $4.25 CSCL 01C

A mathematical model for predicting the three dimensional motion of the balloon system is developed, which includes the effects of bounce, pendulation and spin of each subsystem. Boundary layer effects are also examined, along with the aerodynamic forces acting on the balloon. Various simplified forms of the system mathematical model were developed, based on an order of magnitude analysis. Author

N75-16508*# Kanner (Leo) Associates, Redwood City, Calif.

PROBLEMS OF PARACHUTE TECHNOLOGY

H. Blenk, C. Saliaris, H. G. Heinrich, G. Buenger, K. Lorke, and H.-J. Klewe Washington NASA Feb. 1975 84 p Transl. into ENGLISH from "Probleme der Fallschirmtechnik", Rept. DLR-Mitt-67-22, Deutsche Forschunganstalt fuer Luft- und Raumfahrt, Brunswick, Feb. 1967 108 p Presented at the Inst. fuer Flugmech. Symp. on Parachute Technol., Brunswick, 15 Feb. 1967

(Contract NASw-2481)

(NASA-TT-F-16139; DLR-Mitt-67-22) Avail: NTIS HC $4.75 CSCL 01C

The proceedings of a conference on the problems of

personal parachute development are presented. The subjects discussed include the following: (1) stress distribution in the parachute canopy, (2) parachute stabilization techniques, (3) aerodynamic characteristics of steerable parachutes, (4) parachute materials and (5) parachutes and recovery systems in the supersonic range. Author

N75-16509*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF EXPERIMENTAL AND THEORETICAL BOUNDARY-LAYER SEPARATION FOR INLETS AT INCIDENCE ANGLE AT LOW-SPEED CONDITIONS
E. John Felderman and James A. Albers Washington Feb. 1975 34 p refs
(NASA-TM-X-3194; E-8182) Avail: NTIS HC $3.75 CSCL 20D

Comparisons between experimental and theoretical Mach number distributions and separation locations are presented for the internal surfaces of four different subsonic inlet geometries with exit diameters of 13.97 centimeters. The free stream Mach number was held constant at 0.127, the one-dimensional throat Mach number ranged from 0.49 to 0.71, and the incidence angle ranged from 0 deg to 50 deg. Generally good agreement was found between the theoretical and experimental surface Mach number distributions as long as no flow separation existed. At high incidence angles, where separation was obvious in the experimental data, the theory predicted separation on the lip. At lower incidence angles, the theoretical results indicated diffuser separation which was not obvious from the experimental surface Mach number distributions. As incidence angle was varied from 0 deg to 50 deg, the predicted separation location shifted from the diffuser region to the inlet highlight. Relatively small total pressure losses were obtained when the predicted separation location was greater than 0.6 of the distance between the highlight and the diffuser exit. Author

N75-16510*# Kanner (Leo) Associates, Redwood City, Calif.
AERODYNAMIC DESIGN OF AIRFOIL SECTIONS
K. Uemaya, M. Omura, and T. Tanioka Washington NASA Feb. 1975 40 p refs Transl. into ENGLISH from Mitsubishi Juko Giho (Japan), v. 11, no. 2, 1974 p 1-12
(Contract NASw-2481)
(NASA-TT-F-16141) Avail: NTIS HC $3.75 CSCL 01A

The design of two dimensional subsonic airfoil sections is discussed. The NASA identification system for airfoil configurations is explained. The aerodynamic characteristics of various airfoil configurations are plotted in graph form. The two approaches to airfoil design are analyzed. The principal requirements in airfoil design for aerodynamic performance and geometric profile are identified. The application of wind tunnel tests to determine the characteristics of the airfoil is reported. Author

N75-16511*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTAL AERODYNAMICS CHARACTERISTICS FOR BODIES OF ELLIPTIC CROSS SECTION AT ANGLES OF ATTACK FROM 0 DEG TO 58 DEG AND MACH NUMBERS FROM 0.6 TO 2.0
Leland H. Jorgensen and Edgar R. Nelson Washington Feb. 1975 81 p refs Prepared in cooperation with ARO, Inc., Moffett Field, Calif.
(NASA-TM-X-3129; A-5756) Avail: NTIS HC $4.75 CSCL 01A

An experimental investigation was conducted to measure the static aerodynamic characteristics for two bodies of elliptic cross section and for their equivalent body of revolution. The equivalent body of revolution had the same length and axial distribution of cross-sectional area as the elliptic bodies. It consisted of a tangent ogive nose of fineness ratio 3 followed by a cylinder with a fineness ratio of 7. All bodies were tested at Mach numbers of 0.6, 0.9, 1.2, 1.5, and 2.0 at angles of attack from 0 deg to 58 deg. The data demonstrate that the aerodynamic characteristics can be significantly altered by changing the body cross section from circular to elliptic and by rolling the body from 0 deg to 90 deg. For example, the first elliptic body (with a constant cross-sectional axis ratio of 2) developed at zero roll about twice the normal force developed by the equivalent body of revolution. At some angles of attack greater than about 25 deg, side forces and yawing moments were measured in spite of the fact that the bodies were tested at zero angle of sideslip. The side-force and yawing-moment coefficients decreased with an increase in Mach number and essentially disappeared for all the bodies at Mach numbers greater than 1.2. From the standpoint of reducing undesirable side forces at high angles of attack, it is best to have the flattest side of the nose of the elliptic bodies pitching against the stream crossflow. The effect of Reynolds number was also the least significant for both elliptic bodies when the flattest side of the nose was pitched against the stream crossflow. Author

N75-16512*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AERODYNAMIC DAMPING AND OSCILLATORY STABILITY IN PITCH AND YAW OF A MODEL OF A PROPOSED MANNED LIFTING ENTRY VEHICLE AT MACH NUMBERS FROM 0.20 TO 1.20
Robert A. Kilgore and Edwin E. Davenport 2 Jan. 1975 40 p refs
(NASA-TM-X-72635) Avail: NTIS HC $3.75 CSCL 01C

Wind tunnel tests have been made at angles of attack from about -2 deg to about 22 deg at 0 deg angle of sideslip by using a small-amplitude forced-oscillation technique. Models were tested with upper and lower control flaps both deflected and undeflected. The configuration with flaps deflected has positive damping in both pitch and yaw and is stable in both pitch and yaw except at the higher angles of attack where the tail surfaces are submerged in the wake from the body. Author

N75-16513*# Scientific Translation Service, Santa Barbara, Calif.
EXPERIMENTAL TESTING OF UNSTEADY THREE-DIMENSIONAL LIFTING SURFACE THEORIES FOR INCOMPRESSIBLE FLOW
Horst Hertrich Washington NASA 28 Feb. 1975 108 p refs Transl. into ENGLISH of "Zur Experimentellen Pruefung Instationarer Dreidimensionaler Tragflachentheorien bei Inkompressibler Stroemung", Rept. No. 40 Max Planck Inst. for Fluid Dynamics and the Aerodynamic Test Facility, 1967 p 1-114
(Contract NASw-2483)
(NASA-TT-F-16200; Rept-40) Avail: NTIS HC $5.25 CSCL 01A

Numerous pressure distribution measurements were made on harmonically oscillating rigid semiwing models with and without a rudder in order to experimentally test various unsteady lifting surface theories. The measurements were carried out with a rectangular and a sweptback wing model with constant chord. The rudder chord was 30% of the wing chord. The model aspect ratios could be adjusted for side ratios. Investigations were carried out for pitch oscillations around various axes perpendicular to the incident flow direction and there were rudder rotational oscillations around the rudder leading edge. This was done at reduced frequencies as well as for the case where there was no incident flow (determination of air mass moving with the models). The measurement results were compared with a lifting surface method, a lifting line method, and the plane theory. Author

N75-16514*# Scientific Translation Service, Santa Barbara, Calif.
CALCULATION OF THREE-DIMENSIONAL SUPERSONIC FLOWS PAST BODIES OF COMPLEX CONFIGURATION
M. Ya. Ivanov and T. V. Nikitina Washington NASA 25 Feb. 1975 14 p refs Transl. into ENGLISH from Uch. Zap. (USSR), v. 4, 1973 p 7-13, A74-36852
(Contract NASw-2483)
(NASA-TT-F-16192; A74-36852) Avail: NTIS HC $3.25 CSCL 01A

The flow pattern of an aircraft model situated at an angle of attack in supersonic inviscid nonheat-conducting flow was analyzed. The steady state system of equations, written in the form of conservation laws, was integrated with the aid of a straightforward finite difference scheme developed for calculating two- and three-dimensional supersonic nozzle flows, A comparison with results obtained by the method of characteristics showed that the method employed is well suited for engineering calculations. Author

N75-16515# Sandia Labs., Livermore, Calif.
COMPARISON OF A HYBRID PARACHUTE SYSTEM TO CONVENTIONAL PARACHUTE SYSTEMS FOR LAYDOWN DELIVERY OF A BOMB
R. E. Rychnovsky Sep. 1974 20 p refs
(Contract AT(29-1)-789)
(SLL-74-0217) Avail: NTIS HC $3.25

An analytical study has been made to compare the impact conditions for a bomb using three types of parachutes: a hybrid parachute, a conventional staged two parachute system, and a single stage ribbon parachute. The comparison was made for laydown delivery of a 2400-pound bomb released from an altitude of 100 feet. The same parachute weight and pack volume was allowed for each of the three parachute systems. Possible variations in the timing of the deployment and parachute opening sequence and variation in the effective drag areas of the parachutes were considered. The hybrid parachute would provide the lowest impact velocity and highest impact angle of any of the systems considered. It could be delivered from low altitudes, but would not reach its terminal velocity nor have a high impact angle from a 100-foot release altitude. Author (NSA)

N75-16516# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
MEASUREMENTS OF STATIC STABILITY COEFFICIENTS OF AN OGIVE DELTA WING MODEL AT TRANSONIC AND SUPERSONIC SPEEDS
Goeran Ehn Feb. 1974 112 p refs
(Contracts F-INK-11-12-0287; F-INK-07-11966/02871; F-INK-07-12615)
(FFA-TN-AU-876) Avail: NTIS HC $5.25

Wind tunnel measurements of an ogive delta wing model with 64.4 deg leading edge sweepback were carried out in a supersonic transonic I sq meter winp tunnel. Static and dynamic tests were carried out over a range of mach numbers from low transonic speed up to M 1.92, 3- 5-, and 6-component strain gauge balance measurements and flow visualization tests were also performed. The angle of attack range includes angles at which vortex breakdown occurs. ESRO

N75-16517# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
WIND TUNNEL INVESTIGATIONS ON AN AIRPLANE MODEL WITH VARIABLE SWEEPBACK IN THE INCOMPRESSIBLE REGION. PART 2: PRESENTATION OF THE EVALUATED FORCE MEASUREMENTS Final Report [WINDKANALUNTERSUCHUNGEN AN EINEM FLUGZEUGMODELL MIT VARIABLER PFEILUNG IM INKOMPRESSIBLEN BEREICH. TEIL 2: ZUSAMMENSTELLUNG ALLER AUSGEWERTETEN KRAFTMESSUNGEN]
Dieter Schmitt 28 Jun. 1974 221 p refs In GERMAN
Sponsored by Deut. Forschungsgemeinschaft
(IFD-2/74-Pt-2) Avail: NTIS HC $7.25

The influence was investigated of variation of wing sweep, pivot position, horizontal tail surface, angle of attack of the horizontal tail surface, body strake, and sideslip angle on the stationary aerodynamic coefficients of the lateral and longitudinal movement of an aircraft model. The force measurements are presented graphically. Flow diagrams are presented for various configurations of the model and at varied angles of attack, showing the influence of the strake-leading edge turbulence on the variable outer wing. ESRO

N75-16518# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS ON THE PROBLEM OF PROPELLER/WING INTERFERENCE UP TO HIGH ANGLES OF ATTACK [EXPERIMENTELLE UND THEORETISCHE UNTERSUCHUNGEN ZUM PROBLEM DER PROPELLER-FLUEGEL-INTERFERENZ BIS ZU HOHEN ANSTELLWINKELN]
Bernd Straeter 20 Dec. 1973 181 p refs In GERMAN
(IFD-5/73) Avail: NTIS HC $7.00

Propeller-wang interactions for variable propeller modulus and variable propeller-wing distances were measured on a model during wind tunnel tests. Procedures for calculating wing coefficients and for the determination of the total force coefficients of propeller-wing configurations were developed. Theoretical procedures are in good agreement with experimental results. ESRO

N75-16519# Saab-Scania, Linkoping (Sweden). Aerospace Div.
APPLICATION OF THE POLAR COORDINATE METHOD TO OSCILLATING WING CONFIGURATIONS
Valter J. E. Stark [1973] 43 p refs Sponsored in part by Swed. Board for Tech. Develop.
(SAAB-TN-69) Avail: NTIS HC $3.75

A previously published method for the calculation of aerodynamic forces on oscillating wings with partial span control surfaces in subsonic flow by using polar integration variables was generalized and programmed in FORTRAN. The program can treat combinations of up to 10 trapezoidal surfaces with several control surfaces and tabs. The input data for the deflection modes may consist of measured values. These are treated by a subprogram that fits a function with suitable edge characteristics to the data for each mode. Numerical results are given for several configurations. Comparisons for simple modes with results of other methods show close agreement in most cases. Author (ESRO)

N75-16520# National Physical Lab., Teddington (England). Aerodynamics Div.
SOME RESULTS OF WIND-TUNNEL TESTS ON AN AEROFOIL SECTION (NPL 9510) COMBINING A 'PEAKY' UPPER SURFACE-PRESSURE DISTRIBUTION WITH REAR LOADING
D. J. Hall, V. G. Quincey, and R. C. Lock London Aeron. Res. Council 1974 35 p refs Supersedes ARC-31312
(ARC-CP-1292; ARC-31312) Avail: NTIS HC $3.75; HMSO 60p; PHI $2.55

Experimental results are presented for an 11 percent thick airfoil, NPL 9510, designed to combine a region of shock-free supersonic flow over most of the upper surface with a substantial amount of rear loading. To alleviate adverse pressure gradients on the upper surface just ahead of the trailing edge, a 0.5 percent thick blunt-base was used. The design aims were principally achieved at Mach number equal 0.79 and C sub L equal 0.6. This represents at least a 10 percent increase in drag rise Mach number over a conventional section of the same thickness and lift coefficient. Separation margins at the design condition are very small and an undesirable drag creep appears at lower Mach numbers. Author (ESRO)

N75-16521# Royal Aircraft Establishment, Farnborough (England)j Structures Dept.
THE EFFECT OF STEADY TAILPLANE LIFT ON THE OSCILLATORY BEHAVIOUR OF A T-TAIL FLUTTER MODEL AT HIGH SUBSONIC SPEEDS
R. Gray and D. A. Drane London Aeron. Res. Council 1974 37 p refs Supersedes RAE-TR-71189; RAE-TR-72137; ARC-33863; ARC-34095
(ARC-R/M-3745; RAE-TR-71189; RAE-TR-72137; ARC-33863; ARC-34095) Avail: NTIS HC $3.75; HMSO £1.45; PHI $5.80

The oscillatory behavior of a T-tail was investigated at high subsonic Mach numbers on an aeroelastic model having tailplane settings of 0 and 3 deg. There is broadly satisfactory agreement between calculated and measured values of modal frequency and damping. The comparison was based mainly on the flutter margin criterion of Zimmerman and Weissenburger, since the more conventional comparisons are inconclusive. Author (ESRO)

N75-16522# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
LOW-SPEED WIND-TUNNEL TESTS ON SOME SLENDER AIRBUS CONFIGURATIONS
D. A. Kirby and A. G. Hepworth London Aeron. Res. Council 1974 57 p refs Supersedes RAE-TR-71216; ARC-33488
(ARC-R/M-3747; RAE-TR-71216; ARC-33488) Avail: NTIS HC $4.25; HMSO £2.25; PHI $8.72

An experimental investigation was made of the subsonic lift, drag, and longitudinal stability characteristics of models representing some alternative slender airbus configurations. For the same wing planform of aspect ratio 1.4 the lift, drag, and pitching moment were measured for two wings of maximum

thickness/chord ratio 4 and 9%, respectively, both without and with various body arrangements. Trailing-edge controls were cut on the 4% wing, and the results were used to compare trimmed lift and drag coefficients for several alternative aircraft layouts. Included are the results of some tests with a foreplane which showed that considerable gains in usable lift coefficient and lift-drag ratio could be obtained with a high foreplane low wing configuration. Author (ESRO)

N75-16523# European Space Research Organization, Paris (France).

CALCULATION OF THE EFFECTS OF PERMEABLE WALLS ON SUPERCRITICAL FLOW

Pierre Laval et al Oct. 1974 45 p refs Transl. into ENGLISH of Calcul des Effets de Faroi Permeable en Ecoulement Supercritique, ONERA-NT-211, Onera, 6 Mar. 1973

(ES O-TT-97; ONERA-NT-211) Avail: NTIS HC $3.75

A time dependent method was developed to compute supercritical flow over an airfoil in a wind tunnel test section with perforated or solid walls. The time dependent equations of motion was calculated numerically by means of an explicit second order scheme. A parameter dependent on time and spatial variables was introduced under the term of artificial viscosity to assure the stability of the scheme. The perforated section of the wall is represented by a continuously permeable wall on which the relation of pressure jump to normal velocity component is given. The applications presented concern the calculations of supercritical flow over a biconvex airfoil and over the NACA 0012 airfoil at zero angle of attack for various values of the porosity parameter. The results obtained show that the present methods allow the wall permeability effects to be calculated and are in good agreement with the experimental data. Author (ESRO)

N75-16524# European Space Research Organization, Paris (France).

EXPLICIT APPROXIMATE EQUATIONSGOR CALCULATING MACH NUMBER AND VARIOUS AIRSPEEDS

Werner Boegel Oct. 1974 29 p refs Transl. into ENGLISH of Explizite Naeherungsgleichungen zur Berechnung der Machzahl u. verschiedener Geschwindigkeiten, DLR-Mitt-74-08, DFVLR, 23 Jan. 1974

(ESRO-TT-100; DLR-Mitt-74-08) Avail: NTIS HC$3.75; DFVLR, Porz, West Ger. 12.60 DM

Explicit approximation equations were derived for calculating the Mach number, airspeed, calibrated airspeed, and equivalent airspeed from pressures and temperatures measured in flight. Equations for the supersonic range were developed. These equations can be evaluated with the help of very simple digital computers. The error of these equations is for the most part below 0.1%. Author (ESRO)

N75-16525# European Space Research Organization, Paris (France).

AUXILIARY FUNCTIONS OF THE THEORY FOR OSCILLATING LIFTING SURFACE OF HIGH ASPECT RATIO FOR MACH NUMBERS BETWEEN 0 AND 1. PART 1: ANALYTICAL REPRESENTATION

H. G. Kuessner Dec. 1974 32 p refs Transl. into ENGLISH of Hilfsfunktionen zur Theorie der Schwingenden Tragflaechen Grosser Streckung im Bereich der Machschen Zahlen 0 bis 1. Teil 1: Anal. Darstellung, DLR-FB-73-16, DFVLR, 1973

(ES O-TT-111-Pt-1; DLR-FB-73-16) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. 9.90 DM

Starting from the general linear three-dimensional integral equation of first kind of the unsteady lifting surface theory, an approximative theory of the oscillating lifting surface of large aspect ratio is derived for Mach numbers between 0 and 1. For this purpose three basic assumptions are introduced. The two-dimensional integral equation for the oscillating profile is applied. All auxiliary functions involved in this approximative theory are analytically presented in a rational form suitable for numerical calculations. Author (ESRO)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N75-16526# Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.

DEVELOPMENT OF A MODEL TECHNIQUE FOR INVESTIGATING THE PERFORMANCE OF SOFT-GROUND ARRESTERS FOR AIRCRAFT

J. R. Barnes London Aeron. Res. Council 1974 50 p refs Supersedes RAE-TR-71231; ARC-34362

(ARC-CP-1275; RAE-TR-71231; ARC-34362) Avail: NTIS HC $3.75; HMSO 80p; PHI $3.25

The feasibility of using models to investigate the performance of gravel arresters for aircraft is discussed. The experiments were designed using the techniques of physical similarity and dimensional analysis. Tests were conducted with 1 to 9.3 scale models of Lightning and Canberra aircraft in two types of sand, and the results compared with those obtained in earlier full scale experiments. Results showed that the distance required to stop in gravel beds for a given entry speed could be predicted with an accuracy of plus or minus 10 to 15 percent.

Author (ESRO)

N75-16527# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

SOME PREDICTIONS OF CRACK PROPAGATION UNDER COMBINED CABIN PRESSURISATION AND ACOUSTIC LOADINGS

W. T. Kirkby London Aeron. Res. Council 1974 29 p refs Supersedes RAE-TR-73004; ARC-34641

(ARC-CP-1286; RAE-TR-73004; ARC-34641) Avail: NTIS HC $3.75; HMSO 50p; PHI $2.15

The effects of acoustic loading and pressurization cycling on the growth of a longitudinal crack in the pressure cabin of an aircraft are discussed. Results of the analysis show that the contribution to crack growth from acoustic loading may exceed that from pressure cycling, even though acoustic loading alone is not sufficiently severe to initiate fatigue damage. The requirement to account for acoustic loading when establishing the fail safe characteristics of structures is analyzed. Simplifying assumptions are made in the analysis and the need for additional research is stated. Author (ESRO)

N75-16528# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.

AIRCRAFT ACCIDENT REPORTS. BRIEF FORMAT US CIVIL AVIATION ISSUE NUMBER 1 OF 1974 ACCIDENTS

6 Sep. 1974 552 p

(PB-236867/8; NTSB-BA-74-4) Avail: NTIS HC $13.00 CSCL 01B

Selected aircraft accident reports are presented in brief format, occurring in U.S. Civil Aviation operations during calender year 1974. The 898 general aviation accidents contained represent a random selection. The publication is issued irregularly, normally six times each year. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, kind of flying, injury index, aircraft damage, conditions of light, pilot certificate, injuries, and causal factors.

GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N75-16529# Lincoln Lab., Mass. Inst. of Tech. Lexington.
DEVELOPMENT OF A DISCRETE ADDRESS BEACON SYSTEM Quarterly Technical Summary, 1 Jan. - 31 Mar. 1974
1 Apr. 1974 88 p
(Contracts DOT-FA72WAI-261; F19628-73-C-0002; FAA Proj. 034-241-012)
(AD-781326; FAA-RD-74-85) Avail: NTIS HC $4.00 CSCL 09E

The development of a Discrete Address Beacon System (DABS) to provide improved surveillance and communication capabilities for an automated air traffic control system is discussed. Emphasis is placed on the data link radio frequency power budget using probabilistic methods to quantify the relative importance of controllable link parameters, such as ground-antenna height, elevation pattern, sidelobe level, and antenna location. Accomplishments during the reporting period involve the following: (1) a comparison of the low elevation angle performance of several candidate DABS antennas, (2) a method for selecting the best of a number of possible airborne antenna locations, and (3) an assessment of DABS vulnerability to radiation from other navigation from other navigation systems. Author

N75-16530# Illinois Univ., Urbana.
SIMULATOR TESTS OF PILOTAGE ERROR IN AREA NAVIGATION WITH VERTICAL GUIDANCE: EFFECTS OF DESCENT ANGLE AND DISPLAY SCALE FACTOR Final Report, Nov. 1972 - Oct. 1973
Richard J. VanderKolk and Stanley N. Roscoe Oct. 1973 151 p refs
(Contract DOT-FA71WA-2574)
(AD-777889; ARL-73-13/FAA-73-2; FAA-RD-73-202) Avail: NTIS HC $4.00 CSCL 17/7

Environmental and flight variables were systematically controlled to permit precise assessment of the effects on pilotage error of variations in vertical descent angle and vertical guidance display scale factor for each of two pilot groups representing different experience levels. Resulting flight profiles were less complex than those previously employed in that no course changes were required, thereby reducing the need for communications and inflight planning by the pilot. Pilot performance was measured in terms of altitude, crosstrack, airspeed, and procedural errors and information processing rate on an independent side task. Altitude tracking errors increased with descent angle and decreased as display scale factor became more sensitive. Altitude errors for all level-flight conditions and for three-degree descents with sensitive scale factors were smaller than assumed in DO-152, whereas for steeper descents with insensitive scale factors they were larger. Altitude errors for all other conditions tested were not reliably different from values assumed in DO-152. Altitude errors for airline transport pilots were reliably smaller than for commercial instrument pilots for most of the experimental conditions tested. Author

N75-16531# Mitre Corp., McLean, Va.
STUDY OF THE VORTAC SYSTEM AND ITS GROWTH POTENTIAL Final Report
S. Ahmed Meer Nov. 1973 178 p refs
(Contract DOT-FA70WA-2448)
(AD-779336; MTR-6547; FAA-EM-74-9) Avail: NTIS HC $5.50 CSCL 17/7

The basic features of the VORTAC System are described. The inherent signal and equipment constraints to future development of the system are identified. It is shown that the VORTAC System can evolve to a high-accuracy-high-capacity navigation system for the AATMS time frame of 1995 and beyond. Other topics discussed include system costs, VORTAC deployment, RNAV considerations, and integration of the VORTAC system with Synchro-DABS/DME. Recommendations are made for new modular VOR receiver design and a program for cost-effective station operation. Author

N75-16532# European Space Research Organization, Paris (France).
THE APPLICATION OF OPTIMAL SMOOTHING TECHNIQUES TO THE CALIBRATION OF AN INERTIAL NAVIGATION SYSTEM
Heinz Winter Dec. 1974 47 p refs Transl. into ENGLISH of Die Anwend. Optimaler Glaettungstech. bei der Kalibrierung eines Traegheitsnavigationssystems, DLR-FB-74-18, DFVLR, 6 Feb. 1974
(ESRO-TT-114; DLR-FB-74-18) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. 12 DM

Theoretical and experimental results are presented which show that - compared with conventional gyrocompassing techniques - the application of optimal smoothing leads to a higher accuracy of the determination of gyro and accelerometer errors of an LN3-2A inertial platform. A description of the optimal smoother, consisting of a forward-Kalman filter and a backward-filter, is given. A calibration scheme is investigated, which avoids platform rotation. With this procedure the rapid determination of the sensor errors is possible with high accuracy.
Author (ESRO)

N75-16533# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 2A: FUNCTIONAL ANALYSIS OF AIR TRAFFIC MANAGEMENT Final Report, Nov. 1972 - Jan. 1974
F. Mertes, L. Jenney, and R. Jones Aug. 1974 201 p refs
(Contract DOT-TSC-512)
(PB-236802/5; DOT-TSC-OST-74-14-2A) Avail: NTIS HC $7.25; HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET CSCL 17G

Volume 2 contains the analysis and description of air traffic management activities at three levels of detail functions, subfunctions, and tasks. A total of 265 tasks are identified and described, and the flow of information inputs and outputs among the tasks is specified. (Modified author abstract) GRA

N75-16534# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 2B: FUNCTIONAL ANALYSIS OF AIR TRAFFIC MANAGEMENT (CONTINUED) Final Report, Nov. 1972 - Jan. 1974
F. Mertes Aug. 1974 256 p refs
(Contract DOT-TSC-512)
(PB-236803/3; DOT-TSC-OST-74-14-2B) Avail: NTIS HC $8.50; HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET CSCL 17G
For abstract, see N75-16533.

N75-16535# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 2C: FUNCTIONAL ANALYSIS OF AIR TRAFFIC MANAGEMENT (CONTINUED) Final Report, Nov. 1972 - Jan. 1974
F. Mertes, L. Jenney, and R. Jones Aug. 1974 192 p
(Contract DOT-TSC-512)
(PB-236804/1; DOT-TSC-OST-74-14-2C) Avail: NTIS HC $7.00; HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET CSCL 17G
For abstract, see N75-16533.

N75-16536# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 2D: FUNCTIONAL ANALYSIS OF AIR TRAFFIC MANAGEMENT (CONCLUDED) Final Report, Nov. 1972 - Jan. 1974
F. Mertes Aug. 1974 222 p
(Contract DOT-TSC-512)
(PB-236805/8; DOT-TSC-OST-74-14-2D) Avail: NTIS HC $7.25; HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET CSCL 17G
For abstract, see N75-16533.

N75-16537# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 3: METHODOLOGY FOR MAN-MACHINE TASK ALLOCATION Final Report, Nov. 1972 - Jan. 1974
F. Mertes and L. Jenny Aug. 1974 230 p refs
(Contract DOT-TSC-512)
(PB-236806/6; DOT-TSC-OST-74-14-3) Avail: NTIS HC $7.50; HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET CSCL 17G

Volume 3 describes the methodology for man-machine task allocation. It contains a description of man and machine performance capabilities and an explanation of the methodology employed to allocate tasks to human or automated resources. It also presents recommended allocations of tasks at five incremental levels of automation. (Modified author abstract) GRA

N75-16538# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 4A: AUTOMATION REQUIREMENTS Final Report, Nov. 1972 - Jan. 1974
F. Mertes and L. Jenney Aug. 1974 137 p
(Contract DOT-TSC-512)
(PB-236807/4; DOT-TSC-OST-74-14-4A) Avail: NTIS HC $5.75 HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET

A presentation of automation requirements is made for advanced air traffic management system in terms of controller work force, computer resources, controller productivity, system manning, failure effects, and control/display requirements. It also includes a discussion of the application of the study results to the design and development of AATMS. GRA

N75-16539# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 4B: AUTOMATION REQUIREMENTS (CONCLUDED) Final Report, Nov. 1972 - Jan. 1974
F. Mertes and L. Jenney Aug. 1974 220 p refs
(Contract DOT-TSC-512)
(PB-236808/2; DOT-TSC-OST-74-14-4B) Avail: NTIS HC $7.25 HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET CSCL 17G

For abstract, see N75-16538.

N75-16540# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 5A: DELTA SIMULATION MODEL USER'S GUIDE Final Report, Nov. 1972 - Jan. 1974
F. Mertes, K. Willis, and E. C. Barkley Aug. 1974 192 p
(Contract DOT-TSC-512)
(PB-236809/0; DOT-TSC-OST-74-14-5A) Avail: NTIS HC $7.00 HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET CSCL 17G

The DELTA Simulation Model is described. It includes all documentation of the DELTA (Determination Effective Levels of Task Automation) computer simulativn for use in the Automation Applications Study. Volume 5A includes a user's manual, test case, and test case results. Volume 5B includes a programmer's manual. (Modified author abstract) GRA

N75-16541# TRW Systems Group, McLean, Va.
AUTOMATION APPLICATIONS IN AN ADVANCED AIR TRAFFIC MANAGEMENT SYSTEM. VOLUME 5B: DELTA SIMULATION MODEL PROGRAMMER'S GUIDE Final Report, Nov. 1972 - Jan. 1974
F. Mertes, K. Willis, and E. C. Barkley Aug. 1974 150 p
(Contract DOT-TSC-512)
(PB-236810/8; DOT-TSC-OST-74-14-5B) Avail: NTIS HC $5.75 HC also available from NTIS $59.00/set of 10 reports as PB-236800-SET CSCL 17G

For abstract, see N75-16540.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-16542*# Grumman Aerospace Corp., Bethpage, N.Y.
EFFECTS OF SEVERAL FACTORS ON THEORETICAL PREDICTIONS OF AIRPLANE SPIN CHARACTERISTICS
William Bihrle, Jr. and Billy Barnhart Aug. 1974 277 p refs
(Contract NAS1-12519)
(NASA-CR-132521) Avail: NTIS HC $8.75 CSCL 01C

The influence of different mathematical and aerodynamic models on computed spin motion was investigated along with the importance of some of the aerodynamic and nonaerodynamic quantities defined in these models. An analytical technique was used which included the aerodynamic forces and moments acting on a spinning aircraft due to steady rotational flow and the contribution of the rotary derivatives to the oscillatory component of the total angular rates. It was shown that (1) during experimental-analytical correlation studies, the flight-recorded control time histories must be faithfully duplicated since the spinning motion can be sensitive to a small change in the application of the spin entry controls; (2) an error in the assumed inertias, yawing moments at high angle of attack, and initial spin entry bank angle do not influence the developed spin significantly; (3) damping in pitch derivatives and the center of gravity location play a role in the spinning motion; and (4) the experimental spin investigations conducted in a constant atmospheric density environment duplicate the Froude number only at the initial full-scale spin altitude (since the full-scale airplane at high altitudes experiences large density changes during the spin.) Author

N75-16543*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
EFFECT OF SYMMETRICAL VORTEX SHEDDING ON THE LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF WING-BODY-TAIL COMBINATIONS Final Report
Michael R. Mendenhall and Jack N. Nielsen Washington NASA Jan. 1975 119 p refs
(Contract NAS2-7347)
(NASA-CR-2473) Avail: NTIS HC $5.25 CSCL 01A

An engineering prediction method for determining the longitudinal aerodynamic characteristics of wing-body-tail combinations is developed. The method includes the effects of nonlinear aerodynamics of components and the interference between components. Nonlinearities associated with symmetrical vortex shedding from the nose of the body are considered as well as the nonlinearities associated with the separation vortices from the leading edges and side edges of the lifting surfaces. The wing and tail characteristics are calculated using lifting surface theories which include effects of incidence, camber, twist, and induced velocities from external sources of disturbance such as bodies and vortices. The lifting surface theories calculate the distribution of leading edge and side edge suction which is converted to vortex lift using the Polhamus suction analogy. Correlation curves are developed to determine the fraction of the theoretical suction force which is converted into vortex lift. The prediction method is compared with experimental data on a variety of aircraft configurations to assess the accuracy and limitations of the method. Author

N75-16544*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A FREE FLIGHT INVESTIGATION OF TRANSONIC STING INTERFERENCE
Peter Jaffe 1 Jan. 1975 48 p refs
(Contract NAS7-100)
(NASA-CR-142084; JPL-TM-33-704) Avail: NTIS HC $3.75 CSCL 01C

Transonic sting interference has been studied in a supersonic wind tunnel to obtain free flight and sting support data on identical models. The two principal configurations, representing fuselage bodies, were cigar shaped with tail fins. The others were a sharp 10-deg cone, a sphere, and a blunt entry body. Comparative data indicated that the sting had an appreciable effect on drag

for the fuselage-like configurations; drag rise occurred 0.02 Mach number earlier in free flight, and drag level was 15% greater. The spheres and the blunt bodies were insensitive to the presence of stings regardless of their size. The 10-deg cones were in between, experiencing no drag difference with a minimum diameter sting, but a moderate difference with the largest diameter sting tested. All data tend to confirm the notion that for the more slender bodies the sting not only affects flow but the forebody flow as well. Author

N75-16545# National Aviation Facilities Experimental Center, Atlantic City, N.J.
SIMULATED GROUND-LEVEL STOL RUNWAY/AIRCRAFT EVALUATION. PHASE 3: TESTS Final Report, Jun. - Jul. 1973
Roman M. Spangler, Jr. Aug. 1974 49 p refs
(FAA Proj. 183-591-010)
(AD-783749; FAA-RD-74-96; FAA-NA-73-98) Avail: NTIS HC $3.25

A De Havilland DHC-6 Series 100 Twin Otter was flown by five pilots of varied experience on 7.5 deg steep-gradient approaches onto a ground-level STOL runway. Forty (40) approaches and landings were accomplished using an angle-of-attack indicator (airspeed indicator blocked out) as primary speed control. Pilot performance as compared to performance with the airspeed indicator as primary speed control was slightly improved. A series of 6 deg steep approaches was made in simulated certification landing tests with dry and wet runways at various water depths. Runway friction, stopping, and landing distances were measured, and stopping distance ratios are shown. Maximum vertical touchdown velocities on steep approaches were also evaluated. Author

N75-16546*# Boeing Co., Wichita, Kans.
REQUIREMENTS AND FEASIBILITY STUDY OF FLIGHT DEMONSTRATION OF ACTIVE CONTROLS TECHNOLOGY (ACT) ON THE NASA 515 AIRPLANE
C. K. Gordon Jan. 1975 147 p refs
(Contract NAS1-13061)
(NASA-CR-132555) Avail: NTIS HC $5.75 CSCL 01C

A preliminary design study was conducted to evaluate the suitability of the NASA 515 airplane as a flight demonstration vehicle, and to develop plans, schedules, and budget costs for fly-by-wire/active controls technology flight validation in the NASA 515 airplane. The preliminary design and planning were accomplished for two phases of flight validation. Author

N75-16547*# Mechanics Development Co., Pacific Palisades, Calif.
MEASUREMENTS OF V/STOL AIRCRAFT NOISE MECHANISMS USING PRESSURE CROSS-CORRELATION TECHNIQUES IN A REVERBERANT WIND TUNNEL Final Report
W. C. Meecham and P. M. Hurdle 31 Oct. 1974 78 p refs
(Contract NAS2-7346)
(NASA-CR-137627) Avail: NTIS HC $4.75 CSCL 01B

A 3.8 cm. model jet was operated in a wind tunnel with cross-flow in order to determine the effect on jet noise radiated characteristics. A method was developed for the determination of noise radiating characteristics of sources within reverberant wind tunnels; cross-correlation measurements were used. The averaging time in the cross-correlation is determined by the amount of background noise within the wind tunnel. It was found that cross-flow increases the radiated noise by 10 db. There was some indication of downstream radiation exceeding the sideline radiation. Author

N75-16548*# Kanner (Leo) Associates, Redwood City, Calif.
GLIDERS AND THE ART OF GLIDING
V. M. Zamyatin Washington NASA Mar. 1975 249 p refs Transl. into ENGLISH of the book "Planery i Planerizm" Moscow, Mashinostroyenniye Press, 1974 p 1-248
(Contract NASw-2481)
(NASA-TT-F-16104) Avail: NTIS HC $7.50 CSCL 01C

The aerodynamics, stability, controllability and structural strength of gliders are described. Design and structural materials are discussed, and safety and reliability as well. Glider flight at large angles of attack and in spin are covered in detail. A history of gliders and pilot-training on gliders is reported. The author considers that gliding is an independent field of aviation which has an important contribution to make to the field as a whole. Further development of glider construction is examined, to master flights of greater distance, higher altitude, and greater speed. Author

N75-16549# Aeronautical Research Labs., Melbourne (Australia).
DOVE WING FATIGUE TEST
R. Ellis, D. G. Graff, and B. J. Mitchell May 1974 60 p refs
(ARL/SM-Note-408) Avail: NTIS HC $4.25

A pair of De Havilland 104 wings was tested to obtain the fatigue life of the splice in the main spar tension boom resulting from the incorporation of modification 780, and the overall fatigue characteristics of the wing. The calculated fatigue life for the splice was 65,580 hours. Failure of the main spar tension boom, three inches outboard from the end of the splice, occurred at a total life of 136,740 hours. During the test a number of fatigue cracks were obtained, the majority of a minor nature. These cracks were allowed to grow under surveillance before repair schemes were undertaken to enable testing to continue. Author

N75-16550# Aeronautical Research Labs., Melbourne (Australia).
FATIGUE TESTING OF DH 104 DOVE CENTRE SECTION TENSION BOOMS
R. Ellis and D. G. Graff Jun. 1974 32 p refs
(ARL/SM-Note-409) Avail: NTIS HC $3.75

A fatigue test was carried out on a pair of De Havilland 104 'Dove' wings which were subjected to a 5 level programmed loading representing a West Australian flight spectrum and a ground to air cycle. A resonant vibration technique was used to determine the fatigue life of a splice and the overall fatigue characteristics of the outer wings. During the test, fatigue cracks occurred in the center section boom member and were allowed to propagate under surveillance. When the crack propagation rate increased significantly, and there was a likelihood of complete boom failure, a new boom was fitted. M.J.S.

N75-16551*# Bell Aerospace Co., Buffalo, N.Y.
INTERNAL CONVECTIVE COOLING SYSTEMS FOR HYPERSONIC AIRCRAFT Final Report
F. M. Anthony, W. H. Dukes, and R. G. Helenbrook Washington NASA Feb. 1975 44 p refs
(Contract NAS1-11357)
(NASA-CR-2480) Avail: NTIS HC $3.75 CSCL 01C

Parametric studies were conducted to investigate the relative merits of construction materials, coolants, and cooled panel concepts for internal convective cooling systems applied to airframe structures of hydrogen-fueled hypersonic aircraft. These parametric studies were then used as a means of comparing various cooled structural arrangements for a hypersonic transport and a hypersonic research airplane. The cooled airplane studies emphasized weight aspects as related to the choice of materials, structural arrangements, structural temperatures, and matching of the cooling system heat load to the available hydrogen fuel-flow heat sink. Consideration was given to reliability and to fatigue and fracture aspects, as well. Even when auxiliary thermal protection system items such as heat shielding, insulation, and excess hydrogen for cooling are considered the more attractive actively cooled airframe concepts indicated potential payload increases of from 40 percent to over 100 percent for the hypersonic transport as compared to the results of previous studies of the same vehicle configuration with an uncooled airframe. Author

N75-16552# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
ASYMMETRIC WING LOADS ON A CANBERRA AIRCRAFT DURING FLIGHT IN TURBULENCE
J. P. Thompson London Aeron. Res. Council 1974 28 p refs Supersedes RAE-TR-72164; ARC-34296
(ARC-CP-1270; RAE-TR-72164; ARC-34296) Avail: NTIS HC $3.75; HMSO 45p; PHI $1.95

A study was conducted of the asymmetric load on the wing of a Canberra aircraft under turbulent conditions. The asymmetric part is separated from the symmetric part as far as is possible with the available data. The relationship of the asymmetric part to the rolling acceleration is analyzed. Author (ESRO)

N75-16553# Queen Mary Coll., London (England). Dept. of Aeronautical Engineering.
ANALYSIS OF FLIGHT AND TUNNEL TESTS ON THE FAIREY DELTA 2 RESEARCH AIRCRAFT
R. A. Feik Aeron. Res. Council 1974 85 p refs Supersedes ARC-33992
(ARC-R/M-3738; ARC-33992) Avail: NTIS HC $4.75; HMSO £3.30; PHI $12.89

A detailed comparison of results was made from several series of flight tests, spanning a number of years, on the Fairey Delta 2, with wind tunnel tests on 1/9 and 1/24 scale models and with reference also to simple theoretical results. The Mach number range of interest has been M = 0.6 to M = 1.8. Both longitudinal and lateral characteristics are considered, together with flow field development and surface pressure measurements. In order to help explain several discrepancies observed, special interest was focused on detailed differences in geometry between full scale aircraft and models, on aeroelastic effects, and on differences in flow field development due to scale differences. It has been possible to suggest explanations for many of the discrepancies in terms of these effects. Where possible, reference has been made to other similar aircraft in order to make the conclusions as general as possible. Author (ESRO)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N75-16554*# Decision Sciences Corp., Jenkintown, Pa.
ANALYSIS OF TECHNOLOGY REQUIREMENTS AND POTENTIAL DEMAND FOR GENERAL AVIATION AVIONICS SYSTEMS FOR OPERATION IN THE 1980'S Executive Summary
David M. Cohn, John H. Kayser, George M. Senko, and Donald R. Glenn Jun. 1974 35 p
(Contract NAS2-7888)
(NASA-CR-137628) Avail: NTIS HC $3.75 CSCL 01D

Avionics systems are identified which promise to reduce economic constraints and provide significant improvements in performance, operational capability and utility for general aviation aircraft in the 1980's. Author

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-16555*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
ON THE INVESTIGATION OF CASCADE AND TURBOMACHINERY ROTOR WAKE CHARACTERISTICS Contractor Report, 1 Jul. 1973 - 30 Jun. 1974
R. Raj and B. Lakshminarayana Feb. 1975 242 p refs
(Contract NAS3-17855)
(NASA-CR-134680) Avail: NTIS HC $7.50 CSCL 21E

The objective of the investigation reported in this thesis is to study the characteristics of a turbomachinery rotor wake, both analytically and experimentally. The constitutive equations for the rotor wake are developed using generalized tensors and a non-inertial frame of reference. Analytical and experimental investigation is carried out in two phases; the first phase involved the study of a cascade wake in the absence of rotation and three dimensionality. In the second phase the wake of a rotor is studied. Simplified two- and three-dimensional models are developed for the prediction of the mean velocity profile of the cascade and the rotor wake, respectively, using the principle of self-similarity. The effect of various major parameters of the rotor and the flow geometry is studied on the development of a rotor wake. Laws governing the decay of the wake velocity defect in a cascade and rotor wake as a function of downstream distance from the trailing edge, pressure gradient and other parameters are derived. Author

N75-16556# National Aviation Facilities Experimental Center, Atlantic City, N.J.
JET ENGINE BURN-THROUGH FLAME CHARACTERISTICS Final Report, Jan. - Sep. 1973
Richard Hill Jul. 1974 37 p refs
(FAA Proj. 181-522-010)
(AD-781795; FAA-NA-74-7; FAA-RD-74-19) Avail: NTIS HC $3.25

Tests were run to determine the effect of the angle and radius of curvature of a firewall, with respect to a burnthrough flame, on burnthrough time. No difference was noted in burnthrough time for angles of zero-, 10-, or 20-degrees. A slight increase was noted at 30 degrees, and at 40 degrees no burn-through occurred. No great difference in burnthrough time was noted with a change in the curvature of the firewall. Centerline flatplate impingement pressures and temperatures were measured and graphed for burnthroughs having pressure ratios of 11:1, 9:1, 6:1, and 4:1, and hole sizes of 1, 1.5, and 2 inches. The exit velocity, density, and mass flow rate were also calculated for those flames. The radial flatplate impingement profile was mapped for an 11:1 pressure ratio flame from a 1.5-inch hole. Flame characteristics of 16:1, 20:1, and 25:1 pressure ratio burnthroughs were estimated. Author

N75-16557*# Lockheed Aircraft Corp., Burbank, Calif.
EVALUATION OF ADVANCED LIFT CONCEPTS AND POTENTIAL FUEL CONSERVATION FOR SHORT-HAUL AIRCRAFT
H. S. Sweet, J. H. Renshaw, and M. K. Bowden Washington NASA Feb. 1975 93 p refs
(Contract NAS2-6995)
(NASA-CR-2502) Avail: NTIS HC $4.75 CSCL 01C

The effect of different field lengths, cruise requirements, noise level, and engine cycle characteristics on minimizing fuel consumption and minimizing operating cost at high fuel prices were evaluated for some advanced short-haul aircraft. The conceptual aircraft were designed for 148 passengers using the upper surface-internally blown jet flap, the augmentor wing, and the mechanical flap lift systems. Advanced conceptual STOL engines were evaluated as well as a near-term turbofan and turboprop engine. Emphasis was given to designs meeting noise levels equivalent to 95-100 EPNdB at 152 m (500 ft) sideline. Author

N75-16558# Aeronautical Research Labs., Melbourne (Australia).
AN APPLICATION OF STREAMLINE CURVATURE METHODS TO THE CALCULATION OF FLOW IN A MULTISTAGE AXIAL COMPRESSOR
D. E. Glenny May 1974 50 p refs
(ARL/ME-Note-346) Avail: NTIS HC $3.75

The performance of a multistage axial compressor, predicted by a computer model using a streamline curvature technique, is considered in terms of the flow development within the compressor and the assumptions inherent in the program. An analysis of the results shows that provided adequate allowance is made for the effects of the growth of the annular boundary layers and the development of stall regions within the blade rows the overall predicted stage by stage flow characteristics are consistent with those known to exist in the actual compressor. However, at present, it is not possible to determine the necessary annular blockage through the machine without resort to actual experimental data in the flow model. In addition, because of the absence of a suitable means for allowing for secondary flow in the model, it is not possible to consider the development of the flow profiles in the region of the annulus walls. Author

N75-16559*# General Electric Co., Cincinnati, Ohio.
QCSEE TASK 2: ENGINE INSTALLATION PRELIMINARY DESIGN Final Report An Early Dissemination Report
R. E. Neitzel, R. Lee, and A. J. Chamay Jun. 1973 350 p

(Proj. FEDD; Contract NAS3-16726)
(NASA-CR-134738) Avail: NASA Industrial Applications Centers only to U. S. Requesters: HC $9.50/MF $2.25 CSCL 21E

The results of a preliminary design effort for four high-pass turbofan engines with features required for commercial short haul, powered lift transport aircraft are presented. Two engines were configured for each of the externally blown flap installations (under the wing and over the wing). Estimates of installed and uninstalled performance, noise, and weight are defined for each propulsion system. Block diagrams of the systems and graphs of the performance data are provided. Author

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-16560*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
ANALYSIS OF LONGITUDINAL PILOT-INDUCED OSCILLATION TENDENCIES OF YF-12 AIRCRAFT
John W. Smith and Donald T. Berry Washington Feb. 1975 40 p refs
(NASA-TN-D-7900; H-805) Avail: NTIS HC $3.75 CSCL 01C

Aircraft flight and ground tests and simulator studies were conducted to explore pilot-induced oscillation tendencies. Linear and nonlinear calculations of the integrated flight control system's characteristics were made to analyze and predict the system's performance and stability. The investigations showed that the small-amplitude PIO tendency was caused by the interaction of the pilot with a combination of the aircraft's short-period poles and the structural first bending mode zeros. It was found that the large-amplitude PIO's were triggered by abrupt corrective control actions by the pilot, which caused the stability augmentation system servo to position and rate limit. The saturation in turn caused additional phase lag, further increasing the tendency of the overall system to sustain a PIO. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N75-16561*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
APPLICABILITY OF RANDOMDEC TECHNIQUE TO FLIGHT SIMULATOR FOR ADVANCED AIRCRAFT
Robert E. Reed, Jr. and Henry A. Cole, Jr. Jan. 1975 34 p refs
(Contract NAS2-8325)
(NASA-CR-137609; NEAR-TR-80) Avail: NTIS HC $3.75 CSCL 14B

The feasibility of Randomdec analysis to detect certain changes in a flight simulator system is studied. Results show that (1) additional studies are needed to ensure effectiveness; (2) a trade-off exists between development complexity and level of malfunction to be detected; and (3) although the system generally limits the input signals to less than about 5 Hz, higher frequency components in the range of 9 Hz and its harmonics are possible. Author

N75-16562*# Southern Methodist Univ., Dallas, Tex.
PROMETHEUS UNBOUND: A STUDY OF THE DALLAS/FORT WORTH REGIONAL AIRPORT Final Report
Jay D. Starling, James Brown, and Marc I. Dominus Feb. 1975 90 p refs
(Grant NsG-2006)
(NASA-CR-142110) Avail: NTIS HC $4.75 CSCL 01E

The history of the controversies in the development of the Dallas/Fort Worth Regional Airport is detailed. Present technological and organizational management problems are outlined. Maps and illustrations are included. N.E.R.

N75-16563*# Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL INVESTIGATION OF LAMINAR TURBULENT TRANSITION AT THE TEST SECTION WALLS OF A WIND TUNNEL
Yu. V. Lavro and V. M. Filippov Washington NASA Jan. 1975 17 p refs Transl. into ENGLISH from TsAGI, Uch. Zap. (USSR), v. 3, no. 2, 1972 p 60-68
(Contract NASw-2481)
(NASA-TT-F-16145) Avail: NTIS HC $3.25 CSCL 14B

The transition of a laminar boundary layer to a turbulent layer was investigated at the side walls of the test section of a low-turbulence wind tunnel. The main statistical characteristics of the transition region (intermittency coefficient and number) were obtained as functions of the velocity of the incident flow and were described by the normal law of distribution of random variables. Inductive pressure sensors were used for the investigation which made it possible to avoid the perturbing effect of the measuring instrumentation on the flow. Author

N75-16564# National Aviation Facilities Experimental Center, Atlantic City, N.J.
GRAPHIC STUDY OF A SELECTED SITE FOR A SECOND MAJOR AIRPORT IN THE ATLANTA, GEORGIA, TERMINAL AREA Final Report, Jun. - Jul. 1974
John Mauer, W. Robert McCosker, and Francis Willet Aug. 1974 33 p
(FAA Proj. 013-150-010)
(AD-783751; FAA-RD-74-133; FAA-NA-74-33) Avail: NTIS HC $3.25

A graphic simulation study of the Atlanta air traffic control terminal area was requested by the Southern Region to assist in developing a feasible plan for airspace use and air traffic control operations in the Atlanta metropolitan area, assuming the establishment of a second major airport. The second major airport was assumed to be located in the Paulding/Polk County area of Georgia, approximately 15 nautical miles west of Dobbins Air Force Base/Naval Air Station Atlanta, Marietta, Georgia. The study considered instrument operations to all instrument flight rule airports within the Atlanta terminal area. The primary runway configuration considered at the new airport was a northwest/southeast alignment of four parallel runways with two additional parallel north/south runways. The present major airport, William B. Hartsfield Atlanta International Airport, was considered to have four parallel east/west runways. Three other runway alignments for the new airport, a west/northwest and southwest were also studied. The airspace utilization plan herein is an acceptable and feasible plane for the overall Atlanta Terminal Area Complex. The present and proposed airports could operate simultaneously with little interaction; however, the placement of the proposed airport places impacts of varying degrees upon satellite airport operations. Author

N75-16565# Ohio Univ., Athens. Dept. of Electrical Engineering.
INSTRUMENT LANDING SYSTEM IMPROVEMENT PROGRAM: CENTERLINE MONITOR Final Report
Patrick H. Garrett and Robert A. Rondini May 1974 58 p refs
(Contract DOT-FA69WA-2066)
(AD-781797; FAA-RD-74-89; EER-5-16) Avail: NTIS HC $3.75

Results of a study to investigate techniques for assuring Category 3 localizer signal integrity for roll-out guidance indicate that a surveillance method supported by sterilization of specific areas on and near the runway and quality near and farfield monitoring provide the best tradeoff between quality control and practical implementation. A precision, portable localizer detector to provide accuracies of 0.0005 DDM needed for assessing localizer signal quality with respect to ICAO 0.005 DDM standards has been designed, built, and successfully tested. Author

N75-16566# Rome Air Development Center, Griffiss AFB, N.Y.
FAA LIGHTNING PROTECTION STUDY: LIGHTNING PROTECTION REQUIREMENTS FOR AN/GRN-27 (V) INSTRUMENT LANDING SYSTEM Final Report, Nov. 1972 - 31 Jan. 1974
Gene K. Huddleston, John D. Nordgard, and Ronald Larson Apr. 1974 120 p refs
(Contract DOT-FA72WAI-356)
(AD-785859; FAA-RD-74-131) Avail: NTIS HC $7.50

The withstand capabilities and protection requirements for solid state circuits of the AN/GRN-27 (V) Instrument Landing System susceptible to lightning-induced transients on buried control cables are presented. Susceptible circuits and components were indentified from the wiring diagrams as transistors, diodes, relay contacts, and electrolytic capacitors. Withstand capabilities of each circuit were determined analytically using manufacturer's data and a 1000-volt, 10 x 1000 microsecond test waveform. Avalanche diode surge protectors and series resistance are recommended to protect susceptible circuits from lightning-induced transients on buried control cable conductors connected to the circuits. Author

N75-16567# Federal Aviation Administration, Washington, D.C.
REVIEW OF SOIL CLASSIFICATION SYSTEMS APPLICABLE TO AIRPORT PAVEMENT Final Report, May 1973 - May 1974
Eldon J. Yoder May 1974 129 p refs
(AD-783190; FAA-RD-73-169) Avail: NTIS HC $4.75

Soil classification systems used in the paving profession were evaluated to determine the applicability of each for airport pavement design. The three methods studied were the AASHO, FAA and Unified systems. It is shown that the FAA system for fine grained soils is largely dependant upon the liquid limit, whereas the classification by the other methods depends upon both the liquid limit and the plasticity index. A sensitivity analysis was made on the ability of each of the systems to predict various soil properties; the FAA system was found to be more insensitive than the other systems. A statistical analysis made of several soil areas demonstrated that the Unified system is more sensitive in predicting soil behavior than the AASHO and FAA systems. It is recommended that the FAA (1) adopt the Unified system, and (2) institute procedures for pavement design based on strength criteria rather than soil classification. Author

N75-16568# Lockheed Aircraft Service, Inc., Ontario, Calif.
SYSTEMS FOR TRANSPORTING AIRCRAFT ON THE GROUND. PHASE 1A: FEASIBILITY STUDY. PHASE 1B: CONCEPT STUDY Final Report, Jan. - Dec. 1973
Robert W. Forsyth, John P. Forsyth, Nathan N. Shivitz, Ronald R. Mealhow, and Donald R. Holcomb Dec. 1973 238 p refs
(Contract DOT-FA73WA-3200)
(AD-781357; FAA-RD-74-92; SDR-7574; SDR-7723) Avail: NTIS HC $6.00

A study and prototype program to produce improvements in the recovery of disabled aircraft and in the ground movement of aircraft with reductions in noise levels and the emission of pollutants is described. The mission of each system was investigated along with the functions involved in performing the mission. Feasibility of the systems and ability to achieve the desired improvements were determined by developing and applying rational criteria to conceptual systems. Preliminary design information on aircraft recovery systems concepts and aircraft ground movement systems concepts is provided along with comprehensive technique data on these systems. Results of an investigation of the fuel savings realized by conversion from self-propelled taxiing of aircrafts to their movements by ground systems are presented. An investigation of cost/benefit characteristics associated with both the recovery and ground movement systems, considering utilization of existing capital equipment and alternate treatments of costs, and a discussion of the proposed selection of systems to be subjected to further development work are included. Author

N75-16569*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ANALYSIS OF VALIDATION TESTS OF THE LANGLEY PILOT TRANSONIC CRYOGENIC TUNNEL
Edward J. Ray, Robert A. Kilgore, Jerry B. Adcock, and Edwin E. Davenport Washington Feb. 1975 22 p refs
(NASA-TN-D-7828; L-9878) Avail: NTIS HC $3.25 CSCL 14B

A pilot transonic cryogenic pressure tunnel has recently been developed and proof tested at the NASA Langley Research Center. In addition to providing an attractive method for obtaining high Reynolds number results at moderate aerodynamic loadings and tunnel power, this unique tunnel allows the independent determination of the effects of Reynolds number, Mach number, and dynamic pressure (aeroelasticity) on the aerodynamic characteristics of the model under test. The proof of concept experimental and theoretical studies are briefly reviewed. Experimental results obtained on both two- and three-dimensional models have substantiated that cryogenic test conditions can be set accurately and that cryogenic gaseous nitrogen is a valid test medium. Author

N75-16570# National Aviation Facilities Experimental Center, Atlantic City, N.J.
INSET AND POLE-MOUNTED APPROACH LIGHTING SYSTEM SEQUENCE FLASHERS Final Report, Jan. 1963 - Jan. 1973
E. Leon Reamer Apr. 1974 52 p
(AD-777816; FAA-NA-74-5; FAA-RD-74-58) Avail: NTIS HC $3.75 CSCL 01/5

The subject report was to determine the suitability of two types of sequence flashers, pole-mounted and inset, to operate in an approach zone incorporating either inset lighting or above ground lighting. The work involved: (1) laboratory photometric measurements; and (2) analysis of pilot's response to test flying the light system. The results of the tests indicate that with minor modification the units may be used in the field. Author

N75-16571# National Aviation Facilities Experimental Center, Atlantic City, N.J.
TEST AND EVALUATION OF A FEASIBILITY MODEL FOR ILS PERFORMANCE ASSURANCE ON FINAL APPROACH, TOUCHDOWN, AND ROLLOUT Final Report, Jan. - Dec. 1973
Morris Ritter Apr. 1974 65 p refs
(AD-777819; FAA-RD-74-66; FAA-NA-73-113) Avail: NTIS HC $3.75 CSCL 01/5

An evaluation was conducted at the National Aviation Facilities Experimental Center (NAFEC), Atlantic City, New Jersey, to determine the feasibility of a ground monitoring system to accurately detect the path of selected aircraft when on final approach and to eventually use this tracking information to provide a data base for statistical analysis of the Instrument Landing System (ILS) glide slope and localizer performance. The interferometer system (test system) was evaluated by comparing conic angles generated by the interferometer to conic angles generated by the NAFEC phototheodolites during flight approaches (time-paired). Analysis of the data revealed that the interferometer system was not adequate to effectively perform as an ILS performance assurance monitor. Author

N75-16572# Royal Aircraft Establishment, Farnborough (England).
A GENERALISED ANALYSIS OF THE PERFORMANCE OF A VARIETY OF DRIVE SYSTEMS FOR HIGH REYNOLDS NUMBER, TRANSONIC WIND TUNNELS
P. G. Pugh and J. Y. G. Evans Feb. 1974 101 p refs
(RAE-TR-73134; BR39686) Avail: NTIS HC $5.25

Several drive systems for transonic wind tunnels used in aircraft model testing are discussed in terms of man and energy efficiency. These criteria are strongly related to capital cost, running cost, and measurement reliability. The Evans clean flow tunnel, when operated at low charge tube Mach numbers, attains high mass and energy efficiencies for 10 sec run times. The Ludwieg tube drive system has an inherently poor energy efficiency which can be improved by addition of a recovery tube at the expense of mass efficiency. The injector driven wind tunnel attains higher mass efficiency than any other, but at the expense of low energy efficiency which implies high running costs. ESRO

N75-16573# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
THE DESIGN OF THE PASSENGER PROCESSING SYSTEM

FOR AIRPORT TERMINALS
D. Bennets, N. M. Hawkins, P. D. McGinity, M. OLeary, and N. Ashford Aug. 1974 103 p refs
(TT-7407) Avail: NTIS HC $5.25

Current design procedures and recent innovations in design methodology, the latter with particular reference to stochastic modeling techniques, level of service design, and space planning concepts are discussed and appraised. Flexible design concepts as oriented towards passenger requirements, growth of air traffic, and innovations in transport and processing techniques are considered. ESRO

N75-16574# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
EXPERIMENTAL STUDY OF THE TURBULENT BOUNDARY LAYER AT MACH 15 AND 19.8 IN A CONICAL NOZZLE
Edgard Backx Aug. 1974 55 p refs Sponsored by Natl. Fond voor Wetenschap. Onderzoek
(VKI-TN-102) Avail: NTIS HC $4.25

Measurements have been made in the Mach 15 and Mach 19.8 hypersonic turbulent boundary layer formed on the conical nozzle wall of the Longshot nitrogen wind tunnel. The ratio of wall to total enthalpy was 0.15 and 0.113 respectively. The Reynolds number based on momentum thickness was 34,600 and 24,300. The measurement of stagnation temperature, in the 10 msec tunnel running time, was obtained with a resistance thermometer consisting of a very fine wire. It was shown that the classical definition of the boundary layer thickness and the representation of the velocity profile by a power law are unrealistic for these cases. The mean property profiles of Mach number and total temperature were similar to those found by other experimenters. Also total enthalpy-velocity profile was quadratic which is classical for nozzle wall flows. The measurement of mean mass flow with a specially designed probe gives strong evidence that a static pressure gradient exists through the boundary layer. Author (ESRO)

N75-16575# Royal Netherlands Meteorological Inst., De Bilt.
COMPARISON OF A 16m BASE WITH A 160m BASE TRANSMISSOMETER [VERGELIJKING 16m-BASIS MET 160m BASIS TRANSMISSOMETER]
F. Cannemeijer 1974 17 p In DUTCH
(KNMI-V-259) Avail: NTIS HC $3.25

A comparative study was made with a view to replacing transmissometers with a base of 160 m by those with a base of 16 m. The meters are used for airport visibility measurements. The recordings of both meters were compared for transmission during fog conditions. Also, both meters were checked with a number of grey filters (wavelength-independent light attenuators). A wide deviation was found with linear relationship between luminance and recorder readings for the 160 m base meter. ESRO

N75-16576# Transportation Systems Center, Cambridge, Mass.
DESCRIPTION OF A GROUND FACILITY FOR CONDUCTING IONOSPHERIC SCINTILLATION MEASUREMENTS WITH THE ATS-5 SPACECRAFT
W. E. Brown, G. G. Haroules, and W. I. Thompson Jul. 1974 164 p refs
(PB-236651/6; DOT-TSC-OST-73-2) Avail: NTIS HC $6.25 CSCL 14B

Experimental apparatus is described for measuring ionospheric scintillation at the DOT/TSC/Westford Propagation Facility in Westford, Massachusetts. The measurements are made using the L-band (1550 MHz) transmissions from the NASA Applications Technology Satellite 5 (ATS-5) which is in a geostationary orbit. Details of equipment configurations and data analysis procedures are given. GRA

N75-16577# Modern Army Selected Systems Test Evaluation and Review, Fort Hood, Tex.
AIRCRAFT MAINTENANCE TRAILER SYSTEM Final Report, 28 Oct. 1973-10 Jun. 1974
Kenneth W. Allen 20 Sep. 1974 30 p
(AD-786553; MASSTER-Test-FM-195B) Avail: NTIS CSCL 01/5

The user evaluation to confirm the effectiveness of the standard aircraft maintenance trailer system and four prototype adapters was conducted at MASSTER, Fort Hood, Texas, from 28 Oct 73 to 10 Jun 74. The trailer system and prototype adapters were evaluated at aviation unit level with integrated direct support maintenance (IDSM) where they were used to build up and transport large aircraft components. The trailer system, the transmission and rotor hub adapter, and the rotor blade adapter were effective. The AH-IG rotor hub adapter was effective for transport only. The propeller adapter was ineffective. Author (GRA)

N75-17288 Joint Publications Research Service, Arlington, Va.
SCIENTIFIC ACHIEVEMENTS INTRODUCED IN PRACTICE
Kiril B. Serafimov, Nikolay Naplatanov, Vasil Sgurev, Petur Petrov, Zdravko Nikolov, and Aleksandur Ganchev *In its* Transl. on Eastern Europe (JPRS-63772) 31 Dec. 1974 p 1-7 Transl. into ENGLISH from Spisanie Bulgar. Akad. Nauk (Sofia), no. 3, 1974 p 83-91 (For availability see N75-17287 08-99)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N75-16578 British Library Lending Div., Boston Spa (England).
COSMONAUTICS: ACCOMPLISHMENTS AND PROSPECTS
V. Glushko [1974] 5 p Transl. into ENGLISH from the Russian
(BLL-M-23506-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The contributions of space programs to improved understanding of the structure and origin of the universe are discussed in general terms. The use of cosmonautics for weather forecasting, location of minerals, and to agriculture is examined. The prospects of future space exploration using space stations and transport spacecraft are reported. Author

N75-16579*# Arizona Univ., Tucson. Engineering Experiment Station.
ROLE OF GRAVITY IN PREPARATIVE ELECTROPHORESIS
Milan Bier [1975] 241 p refs Original contains color illustrations
(Contract NAS8-29566)
(NASA-CR-120593) Avail: NTIS HC $7.50 CSCL 07D

The fundamental formulas of electrophoresis are derived microscopically and applied to the problem of isotachophoresis. A simple physical model of the isotachophoresis front is proposed. The front motion and structure are studied in the simplified case without convection, diffusion and non-electric external forces. Author

N75-16580*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EXPERIMENTERS' REFERENCE BASED UPON SKYLAB EXPERIMENT MANAGEMENT
Dec. 1974 131 p refs
(NASA-TM-X-72397; M-GA-75-1) Avail: NTIS HC $5.75 CSCL 22A

The methods and techniques for experiment development and integration that evolved during the Skylab Program are described to facilitate transferring this experience to experimenters in future manned space programs. Management responsibilities and the sequential process of experiment evolution from initial concept through definition, development, integration, operation and postflight analysis are outlined and amplified, as appropriate. Emphasis is placed on specific lessons learned on Skylab that are worthy of consideration by future programs. Author

N75-16581*# Martin Marietta Corp., Baltimore, Md.
SKYLAB PROGRAM. EARTH RESOURCES EXPERIMENT PACKAGE. SENSOR PERFORMANCE REPORT. VOLUME 7 (S190B): SL2, SL3 AND SL4 EVALUATIONS
Gerald P. Kenney 25 Oct. 1974 122 p refs
(Contract NAS8-24000)
(NASA-CR-141571; MSC-05528) Avail: NTIS HC $5.25 CSCL 22C

The S190B Earth Terrain Camera (ETC) operated acceptably for all of its scheduled EREP passes throughout the SL2 mission. The crew reported no problems in unstowing the camera, changing filters, installing the ETC window in the SAL, or installing the camera onto the window. The ETC was operated for a total of seven times with no failures. The clock on the ETC was checked on DOY 170 (June 19, 1973) and was found to be 30 min. and 58 sec. slower than GMT. The change in time was expected since a similar circumstance was experienced during ETC qualification testing for launch vibration. A leak existed in the seal of the spare magazine to the camera vacuum interface. For EREP passes 08 and 10, black-and-white film EK 3414 (roll no. 82) was installed in this spare magazine. Since there was an audible hiss, the vacuum hose was not connected to the camera. This caused the vacuum platen to be inoperable, resulting in some degradation in resolution for this roll of film. The vegetation of the South American jungle areas proved to be much darker than vegetation found in the United States, and was consequently about 1/2 stop underexposed in all cases. Author

N75-16582*# Texas Univ., Houston. Dept. of Biomathematics.
STATISTICAL ANALYSIS OF SKYLAB 3
Dennis A. Johnston Nov. 1974 162 p refs
(Contract NAS9-13042)
(NASA-CR-141628) Avail: NTIS HC $6.25 CSCL 22C

The results of endocrine/metabolic studies of astronauts on Skylab 3 are reported. One-way analysis of variance, contrasts, two-way unbalanced analysis of variance, and analysis of periodic changes in flight are included. Results for blood tests, and urine tests are presented. F.O.S.

N75-16583*# Paine Coll., Augusta, Ga. Div. of Natural Science and Mathematics.
STUDY OF MATERIALS FOR SPACE PROCESSING Annual Report, 15 Jan. 1974 - 14 Jan. 1975
R. B. Lal Feb. 1975 100 p refs
(Grant NsG-8002)
(NASA-CR-141236; PC-NAS-002) Avail: NTIS HC $4.75 CSCL 13H

Materials were selected for device applications and their commercial use. Experimental arrangements were also made for electrical characterization of single crystals using electrical resistivity and Hall effect measurements. The experimental set-up was tested with some standard samples. Author

N75-16584*# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations.
ADVANCED SPACE PROGRAM STUDIES: OVERALL EXECUTIVE SUMMARY
L. R. Sitney 30 Sep. 1974 41 p refs
(Contract NASw-2575)
(NASA-CR-142168; ATR-74(7349)-1) Avail: NTIS HC $3.75 CSCL 22A

Studies were conducted to provide NASA with advanced planning analyses which relate integrated space program goals and options to credible technical capabilities, applications potential, and funding resources. The studies concentrated on the following subjects: (1) upper stage options for the space transportation system based on payload considerations, (2) space servicing and standardization of payloads, (3) payload operations, and (4) space transportation system economic analyses related to user charges and new space applications. A systems cost/performance model was developed to synthesize automated, unmanned spacecraft configurations based on the system requirements and a list of equipments at the assembly level. Author

N75-16585# European Space Research Organization, Paris (France).
REPORT PRESENTED TO THE SEVENTEENTH COSPAR MEETING
1974 233 p refs Conf. held at Sao Paulo, Brazil, Jun. 1974
Avail: NTIS HC $7.50

A review of ESRO satellites for 1973 is given. The satellites in orbit or decayed such as ESRO 2/IRIS, ESRO 1/AURORAE and BOREAS, HEOS-1 and HEOS A2, TD-1, and ESRO 4 are included as well as those under development such as COS-B, GEOS, and EXOSAT (formerly HELOS), comprising also the joint undertakings, such as IUE, and the International Magnetospheric Explorer project (IME) Mother/Daughter. ESRO

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-16586* National Aeronautics and Space Administration, Washington, D.C.
APOLLO SOYUZ TEST PROJECT, USA-USSR
10 Jan. 1975 51 p
(NASA-News-Release-75-9) Avail: NASA Scientific and Technical Information Facility P.O. Box 8757, B.W.I. Airport, Maryland 20740 CSCL 03B

The mission plan of the docking of a United States Apollo and a Soviet Union Soyuz spacecraft in Earth orbit to test compatible rendezvous and docking equipment and procedures is presented. Space experiments conducted jointly by the astronauts and cosmonauts during the joint phase of the mission as well as experiments performed solely by the U.S. astronauts and spread over the nine day span of the flight are included. Biographies of the astronauts and cosmonauts are given. Author

N75-16587*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 1: ANALYTICAL MANUAL
P. E. Hong, G. L. Shults, R. J. Boain, K. R. Huling, and T. Wilson Oct. 1974 74 p Revised
(Contract NAS8-29666)
(NASA-CR-120406) Avail: NTIS HC $4.25 CSCL 22A

The computer program MAPSEP, is described. It was designed to provide rapid evaluation of guidance, navigation and performance requirements for spacecraft and mission. The description includes: trajectory and error covariance propagation methods, orbit determination processes, thrust modeling, and trajectory correction (guidance) schemes. Author

N75-16588*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 2: USER'S MANUAL
G. L. Shults, R. J. Boain, K. R. Huling, T. Wilson, and P. E. Hong Oct. 1974 185 p Revised
(Contract NAS8-29666)
(NASA-CR-120407) Avail: NTIS HC $7.00 CSCL 22A

The input/output descriptions of MAPSEP are presented for trajectory generation, linear error analysis, and simulation. Operating guidelines, case stacking, and mixed mode operation are included. F.O.S.

N75-16589*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 3: PROGRAM MANUAL
K. R. Huling, R. J. Boain, T. Wilson, P. E. Hong, and G. L. Shults Oct. 1974 564 p refs Revised
(Contract NAS8-29666)
(NASA-CR-120408) Avail: NTIS HC $13.00 CSCL 21A

The internal structure of MAPSEP is described including the logical flow. The information presented is considered sufficient for the user to make suitable modifications to the program. F.O.S.

N75-16590*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
EFFECTS OF VARIOUS EXPERIMENTAL PARAMETERS ON ERRORS IN TRIANGULATION SOLUTION OF ELONGATED OBJECT IN SPACE
Sheila Ann T. Long Washington Feb. 1975 30 p refs
(NASA-TN-D-7802; L-9803) Avail: NTIS HC $3.75 CSCL 22C

The effects of various experimental parameters on the displacement errors in the triangulation solution of an elongated object in space due to pointing uncertainties in the lines of sight have been determined. These parameters were the number and location of observation stations, the object's location in latitude and longitude, and the spacing of the input data points on the azimuth-elevation image traces. The displacement errors due to uncertainties in the coordinates of a moving station have been determined as functions of the number and location of the stations. The effects of incorporating the input data from additional cameras at one of the stations were also investigated. Author

N75-16591*# Radio Corp. of America, Burlington, Mass. Government Communications and Automated Systems Div.
TRACKING TECHNIQUES FOR SPACE SHUTTLE RENDEZVOUS Final Report
[1975] 184 p
(Contract NAS9-13576)
(NASA-CR-141630) Avail: NTIS HC $7.00 CSCL 22C

The space shuttle rendezvous radar has a requirement to track cooperative and non-cooperative targets. For this reason the Lunar Module (LM) Rendezvous Radar was modified to incorporate the capability of tracking a non-cooperative target. The modifications are discussed. All modifications except those relating to frequency diversity were completed, and system tests were performed to confirm proper performance in the non-cooperative mode. Frequency diversity was added to the radar and to the special test equipment, and then system tests were performed. This last set of tests included re-running the tests of the non-cooperative mode without frequency diversity, followed by tests with frequency diversity and tests of operation in the original cooperative mode. Author

N75-16592# European Space Research Organization, Paris (France).
A SATELLITE ORBIT MODEL WITHOUT SINGULARITIES
Martin Eckstein Oct. 1974 58 p refs Transl. into ENGLISH of Ein Satellitenbahnmodell ohne Singularitaeten, DLR-FB-73-67, DFVLR, 11 May 1973
(ESRO-TT-102; DLR-FB-73-67) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 20.60 DM

Satellite orbit models based on the classical set of elements consisting of semi-major axis, eccentricity, inclination, argument of perigee, longitude of the ascending node, and the time of perigee passage, contain singularities for circular and equatorial orbits. The singularities appear in both the perturbations and the partial derivatives, which have to be calculated in order to perform a differential orbit correction procedure. A satellite orbit model is described which is based on a different set of regular elements avoiding such singularities. The complicated algebraic transformations, which are necessary to express the partial derivatives and Kozai's perturbation theory in terms of the regular elements, were performed on a computer by means of FORMAC. Author (ESRO)

N75-16593# European Space Operations Center, Darmstadt (West Germany).
PERTURBATION OF A TEST BODY BY A MASSIVE RING IN A NEWTONIAN FIELD
E. A. Roth ESRO Paris May 1974 28 p refs
(ESRO-SR-21-ESOC) Avail: NTIS HC $3.75

The motion of an interplanetary space probe was investigated in a central Newtonian gravity field perturbed by the attraction of a concentric massive circular ring, representing the ring of asteroids. Using a first-order perturbation theory, an explicit solution is given for the first two terms of the expansion of the perturbing potential. Author (ESRO)

N75-17240* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
IMPACT OF SATURN'S RINGS ON MISSION ANALYSIS FOR MJS 77
Paul A. Penzo *In* NASA, Washington The Rings of Saturn 1974 p 39-50 (For availability see N75-17236 08-88)
CSCL 22A

N75-17252* State Dept., Washington, D.C.
THE MARINER JUPITER/SATURN RING OCCULTATION EXPERIMENT
Von R. Eshleman *In* NASA, Washington The Rings of Saturn 1974 p 155-166 (For availability see N75-17236 08-88)
CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N75-16594*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CVT/GPL PHASE 3 INTEGRATED TESTING
R. E. Shurney, Eddie Cantrell, George Maybee, R. E. Shurney, and Stan Schmitt Jan. 1975 148 p
(NASA-TM-X-64902) Avail: NTIS HC $5.25 CSCL 14B

The hardware for 20 candidate shuttle program life sciences experiments was installed in the GPL and experiments were conducted during a 5-day simulated mission. The experiments involved humans, primates, rats, chickens, and marigold plants. All experiments were completed to the satisfaction of the experimenters. In addition to the scientific data gathered for each experiment, information was obtained concerning experiment hardware design and integration, experiment procedures, GPL support systems, and test operations. The results of the integrated tests are presented. Author

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-16595*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ACCELERATIONS EXPERIENCED DURING LOW-G FLIGHT OF BLACK BRANT VC (NAS 21.015) ON 4 OCTOBER 1974
Ralph Kissel Jan. 1975 35 p
(NASA-TM-X-64903) Avail: NTIS CSCL 16B

This investigation was to determine whether a Black Brant VC (BBVC) sounding rocket equipped with the Goddard Space Flight Center (GSFC) rate control system (RCS) would produce g-levels which are satisfactory for space processing. Accelerations measured by the Marshall Space Flight Center (MSFC) low-g accelerometer system (LGAS) were compared with accelerations calculated from measured payload RCS gyro data during a low-g flight of BBVC NAS 21.015 at White Sands Missile Range, N.M., on October 4, 1974. Accelerations of up to 0.0002 g existed at the LGAS accelerometers from 70 through 420 sec (5.8 min), with the exception of a spike at 101 sec of 0.0004 g which occurred when the RCS was activated the second time. Accelerations of 0.0001 g existed from 140 through 400 sec (4.3 min). Accelerations of 0.0002 g along the roll axis up to 150 sec and of 0.0015 g in the lateral plane at about 135 sec are being investigated by GSFC. They may be associated with leaking thruster valves or a leak in one of the heat pipe experiments. The vehicle rate buildup each time after the RCS nulls out are also being investigated by GSFC. This rate caused most of the 0.0001 g acceleration experienced after 150 sec into the flight. Aerodynamic drag produced no significant accelerations after about 80 sec. The principal conclusion was that the BBVC with the GSFC RCS produces g-levels satisfactory for space processing. Author

N75-16596*# Kanner (Leo) Associates, Redwood City, Calif.
THE SIGNIFICANCE OF THE ANS PROJECT FOR DUTCH INDUSTRY

J. H. Spaa Washington NASA Feb. 1975 16 p Transl. into ENGLISH from Ruimtevaart, (Netherlands), v. 23, 1974 p 59-69
(Contract NASw-2481)
(NASA-TT-F-16154) Avail: NTIS HC $3.25 CSCL 22C

The ANS (Astronomical Netherlands Satellite) project the first substantial research and development project to be undertaken by the Dutch aerospace and electronics industry with government support is discussed. The economic and technological advantages which will ensue from this project and the subsequent undertaking of similar projects in the future are presented. Author

N75-16597*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITES: NEW GLOBAL OBSERVING TECHNIQUES FOR ICE AND SNOW
Per Gloersen and Vincent V. Salomonson Oct. 1974 38 p refs Submitted for publication Original contains color illustrations
(NASA-TM-X-70819; X-910-74-309) Avail: NTIS HC $3.75 CSCL 22B

The relation of aereal extent of snow cover to the average monthly runoff in a given watershed was investigated by comparing runoff records with a series of snowcover maps. Studies using the high spatial resolution available with ERTS-1 imagery were carried out for the Wind River Mountains watersheds in Wyoming, where it was found that the empirical relationship varied with mean elevation of the watershed. In addition, digital image enhancement techniques are shown to be useful for identifying glacier features related to extent of snowcover, moraine characteristics, and debris average. Longer wavelength observations using sensors on board the Nimbus 5 Satellite are shown to be useful for indicating crystal size distributions and onset of melting on glacier snow cover. Author

N75-16598*# Perkin-Elmer Corp., Danbury, Conn. Optical Technology Div.
INTERNAL ULTRAVIOLET EXPLORER (IUE) STUDY PROGRAM. VOLUME 1: TECHNOLOGY DISCUSSION Final Report, Feb. - Aug. 1974
T. S. Turner, Jr. Nov. 1974 99 p refs 2 Vol.
(Contract NAS5-23327)
(NASA-CR-143682; ER-267-Vol-1) Avail: NTIS HC $4.75 CSCL 22B

The results of a simulation study to predict the IUE imaging chain performance are presented, including simulation photographs and transparencies of ultraviolet echelle spectra. Errors in wavelength determination and radiometric measurements due to system degradation are indicated to be minor. Some order overlap is predicted at the bottom of the echelle format. Author

N75-16599# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 16
K. S. Russell 5 Jun. 1974 41 p ref
(ROE-STS-187-Pt-16) Avail: NTIS HC $3.75

Timed observations, made in azimuth and elevation with a kinetheodolite at Earlyburn Outstation, are listed in satellite launch and time order: fully reduced observations of 36 transits of satellites 1964-53B, 1964-63A, and 1964-64 A.
Author (ESRO)

N75-16600# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
KINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 17
K. S. Russell 6 Jun. 1974 34 p ref
(ROE-STS-188-Pt-17) Avail: NTIS HC $3.75

Timed observations, made in azimuth and elevation with a kinetheodolite at Earlyburn Outstation, are listed in satellite launch and time order: fully reduced observations of 29 transits of satellites 1964-69 B, 1964-72 A, 1964-76 A, 1964-76 C, 1964-80 A, 1964-83 A, 1965-03 A, 1965-06 B, 1965-11 A, 1965-14 A, 1965-14 B, 1965-16 A. Author (ESRO)

N75-16601# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, AUGUST 1974
R. D. Eberst 24 Sep. 1974 44 p
(ROE-STS-193) Avail: NTIS HC $3.75

Stopwatch observations made at stations connected with the Satellite Tracking Section during August 1974 are listed in satellite launch and time order: A total of 1085 fully reduced observations of 178 satellites is reported. Author (ESRO)

N75-16602# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, SEPTEMBER 1974
R. D. Eberst 11 Oct. 1974 40 p
(ROE-STS-194) Avail: NTIS HC $3.75

Stopwatch observations made at stations connected with the Satellite Tracking Section during September 1974 are listed in satellite launch and time order: A total of 888 fully reduced observations of 174 satellites is reported. Author (ESRO)

N75-16603# European Space Research Organization, Paris (France).
ELEVENTH HANDLEY PAGE MEMORIAL LECTURE. SPACELAB: EUROPE'S ORBITAL LABORATORY
D. J. Shapland Jun. 1974 54 p Presented to the Roy. Aeron. Soc., London, 26 Jun. 1974
Avail: NTIS HC $4.25

The objectives of the Spacelab program are discussed. The Spacelab concept is described and preliminary plans for the design and development are provided. Management procedures for the first program are presented and the operation of Spacelab by the user community is illustrated. ESRO

N75-16604# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
ANALYTICAL COMPARATIVE STUDY OF SPACECRAFT INJECTION SYSTEMS Final Report
Sep. 1974 230 p Sponsored by ELDO
(MBB-UR-V-75(74); ESRO-CR(P)-558) Avail: NTIS HC $7.50

Main design features and application areas are summarized of four propulsion module concepts for orbit transfer and injection, based on the availability of high reliability propulsion components from the Symphonie program. Advantages of liquid propulsion modules for their high versatility are underlined. The development of a European propulsion module family would cover all the different mission tasks foreseeable for the next decade, geosynchronous apogee injection of smaller satellites, geocentric bi-impulse transfer of larger TV broadcasting satellites, shuttle and tug missions, and planetary probes. ESRO

N75-16605# European Space Research Organization, Paris (France).
ESRO APPLICATIONS SATELLITES
C. Rosetti and J. P. Contzen 1974 27 p Presented at the UN Panel Meeting on Satellite Broadcasting Systems for Educ. Tokyo, 1974
Avail: NTIS HC $3.75

The ESRO programs and their user oriented features and international cooperation aspects are stressed. A regional communication satellite system using frequencies around 12 GHz is being set up for Europe. An experimental preoperative satellite (OTS) with 5000 telephone channels and two television programs (Eurovision) or alternatively 6000 telephone channels, also carrying telecommunication experiments will be launched early in 1977. The Maritime Satellite Program (MAROTS), the Aeronautical Satellite Program (AEROSAT), and the Meteorological Satellite Program (METEOSAT) are also reviewed. Prospective studies and activities of the organization in the next decade are featured.
ESRO

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N75-16606*# Emerson Electric Co., Washington, D.C. Electronics and Space Div.

NONCOOPERATIVE RENDEZVOUS RADAR SYSTEM Final Report

Oct. 1974 235 p

(Contract NAS9-13695)

(NASA-CR-141627) Avail: NTIS HC $7.50 CSCL 17I

A fire control radar system was developed, assembled, and modified. The baseline system and modified angle tracking system are described along with the performance characteristics of the baseline and modified systems. Proposed changes to provide additional techniques for radar evaluation are presented along with flight test data. J.M.S.

N75-16607# Royal Aircraft Establishment, Farnborough (England).

THE DEVELOPMENT OF SPACECRAFT DATA HANDLING SYSTEMS 1963 - 1973

D. W. Allen Apr. 1974 62 p refs

(RAE-TR-73196; BR40617) Avail: NTIS HC $4.25

The work of the Spacecraft Data Handling Section of the Space Department over the decade 1963-1973 is reviewed. The reasoning behind the progressive development leading up to a modular pulse code modulation system is indicated with emphasis on the problems of procuring reliable electronic components. Systems of soldered constructions using conventional components and integrated circuits and a thick film assembly method known as multi-chip integration were developed. Orbit performance of the first three UK satellites, Ariel 3 and 4 and Prospero, provided the basis for these last developments. Author (ESRO)

N75-16608# European Space Research and Technology Center, Noordwijk (Netherlands). Communications Systems Div.

COMMUNICATIONS SATELLITES PROGRAMME. A GUIDE FOR OTS COMMUNICATIONS EXPERIMENTERS

A. J. Bayliss Apr. 1974 40 p refs Presented at the European Conf. on Electrotechnics, Amsterdam, 22-26 Apr. 1974

HC $3.75

A guide is presented for those who may wish to cooperate with ESRO in using the communication facilities provided by the Orbital Test Satellite (OTS). The facilities provided by the satellite are explained, the experiments which may be performed are categorized, and the earth station interface requirements are indicated. The OTS communications payload comprises a multichannel microwave repeater subsystem together with its group of antennas. The repeater, consists of 2 modules and operates in the 11/14 GHz bands. ESRO

N75-16609# European Space Research and Technology Center, Noordwijk (Netherlands).

OPTIMIZING A TDMA CHANNEL INCLUDING SYNCHRONIZATION

Leif Lundquist 1974 4 p refs Presented at the Intern. Conf. on Commun., Minneapolis, 16-19 Jun. 1974

Avail: NTIS HC $3.25

The results of a pulse shaping filter optimization study for a 4 phase PSK nonlinear satellite channel taking into account the effects of carrier and clock recovery are presented. The trade off between adjacent channel interference and inter symbol interference is shown, and it was concluded that Nyquist filters with about 50% rolloff is optimum. Some comparisons of having different filters in the signal and carrier recovery branch are shown, data also show that it is necessary to have a filter before the carrier recovery circuits to suppress adjacent channel interference. This filter could be all or part of the receiver pulse shaping filter. Author (ESRO)

N75-16610# European Space Research and Technology Center, Noordwijk (Netherlands).

MEASUREMENTS OF ATMOSPHERIC EMISSION AT 11 GHz IN THE EUROPEAN REGION

F. M. Galante 1974 37 p refs Presented at the European Conf. on Electrotech., Amsterdam, 22-26 Apr. 1974

Avail: NTIS HC $3.75

Results of atmospheric attenuation measurements at 11.4 GHz at several locations in Europe are presented. The tests were carried out with a view to determining the best orbital position of the European Communication Satellite. Sites were chosen on the basis of their latitude and climate, and the antenna of the Dicke-type radiometers used was pointed at the probable orbital position. A capacitor rain gage was set up near each radiometer to ascertain whether there is a rough correlation between attenuation and local rainfall. Monthly attenuation statistics are discussed. There is evidence that the highest 0.1% time attenuations depend on the antenna elevation angle and that the ESRO theoretical model, in the absence of statistics for periods longer than those considered, is a fair basis for satellite/ground link calculations. ESRO

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-16611*# Rockwell International Corp., Downey, Calif. Space Div.

SIX DEGREE OF FREEDOM FORTRAN PROGRAM, ASTP DOCKING DYNAMICS, USERS GUIDE

G. O. Mount, Jr. and B. Mikhalkin Jun. 1974 377 p

(Contract NAS9-13100)

(NASA-CR-141470; SD74-CS-0023) Avail: NTIS HC $10.25 CSCL 22A

The digital program ASTP Docking Dynamics as outlined is intended to aid the engineer using the program to determine the docking system loads and attendant vehicular motion resulting from docking two vehicles that have an androgynous, six-hydraulic-attenuator, guide ring, docking interface similar to that designed for the Apollo/Soyuz Test Project (ASTP). This program is set up to analyze two different vehicle combinations: the Apollo CSM docking to Soyuz and the shuttle orbiter docking to another orbiter. The subroutine modifies the vehicle control systems to describe one or the other vehicle combinations; the rest of the vehicle characteristics are changed by input data. To date, the program has been used to predict and correlate ASTP docking loads and performance with docking test program results from dynamic testing. The program modified for use on IBM 360 computers. Parts of the original docking system equations in the areas of hydraulic damping and capture latches are modified to better describe the detail design of the ASTP docking system. Author

N75-16612*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FLIGHT PERFORMANCE OF A NAVIGATION, GUIDANCE,

AND CONTROL SYSTEM CONCEPT FOR AUTOMATIC APPROACH AND LANDING OF SPACE SHUTTLE ORBITER

Frederick G. Edwards, John D. Foster, Daniel M. Hegarty, Donald W. Smith, Fred J. Drinkwater, III, and Rodney C. Wingrove Washington Feb. 1975 68 p refs

(NASA-TN-D-7899; A-5321) Avail: NTIS HC $4.25 CSCL 22B

Unpowered automatic approaches and landings were conducted to study navigation, guidance, and control problems associated with terminal area approach and landing for the space shuttle vehicle. The flight tests were performed in a Convair 990 aircraft equipped with a digital flight control computer connected to the aircraft control system and displays. The tests were designed to evaluate the performance of a navigation and guidance concept that utilized blended radio/inertial navigation with VOR, DME, and ILS as the ground navigation aids. Results from 36 automatic approaches and landings from 11,300 m (37,000 ft) to touchdown are presented. Preliminary results indicate that this concept may provide sufficient accuracy to accomplish automatic landing of the shuttle orbiter without air-breathing engines. Author

N75-16613*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

VARIABLE DIHEDRAL SHUTTLE ORBITER Patent Application

Bernard Spencer, Jr., John W. Wilkey, Jr., and Beverly Z. Henry, Jr., inventors (to NASA) Filed 11 Feb. 1975 10 p

(NASA-Case-LAR-10706-1; US-Patent-Appl-SN-549239) Avail: NTIS HC $3.25 CSCL 22B

An aircraft configuration is described which yields efficient flight at both subsonic and hypersonic speeds and which permits the wings to be protected from the hostile heat environment of orbital reentry. The essential feature is a variable dihedral wing which may be folded out during flight to adjust the aircraft's flight characteristic as the speed decreases. During hypersonic flight the wings are folded upright against the fuselage, while for the lowest speed operation the wings are fully extended in a horizontal manner. Intermediate positions of extension are used for intermediate speed ranges. NASA

N75-16614# European Space Research Organization, Paris (France).

A CONTRIBUTION TO THE DESIGN OF RE-ENTRY VEHICLES

Panajotis Evangelou Nov. 1974 108 p refs Transl. into ENGLISH of Ein Beitr. zum Entwurf von Wiedereintrittsflugkoerpern, DLR-FB-73-70, DFVLR, 23 May 1973

(ESRO-TT-106; DLR-FB-73-70) Avail: NTIS HC $5.25; DFVLR, Porz, West Ger. 35.90 DM

Reentry configurations and fundamental design works, needed for the dimensioning of reentry configurations, are investigated. Information about the main design conditions is given. A combination of the relationships for a quick estimation of the flight performance as well as of the heating rates and aerodynamic coefficients in each flight range is given. Basic forms of reentry configurations are derived and discussed.

Author (ESRO)

N75-16615# Engins Matra, Velizy (France).

TD-1A: EVALUATION OF ATTITUDE CONTROL SYSTEM FROM TELEMETRY DATAS. VOLUME 2: TM DATA PLOTS Final Report

Jul. 1974 191 p 2 Vol.

(Contracts ESTEC-1968; ESTEC-1945/73)

(ESRO-CR(P)-555-Vol-2) Avail: NTIS HC $7.00

Graphs are presented to show the stability characteristics of the attitude control system for the TD-1 satellite. The data are based on telemetry results obtained during analysis of the satellite orbit. ESRO

N75-16616# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

DEVELOPMENT OF A FLEXIBLE OPTICAL SOLAR REFLECTOR STABLE UNDER SPACE ENVIRONMENT Final Report

L. Preuss 31 Aug. 1973 130 p

(Contract ESTEC-1534/71-HP)

(MBB-UR-194-73; ESRO-CR(P)-562) Avail: NTIS HC $5.75

For the development of flexible optical solar reflectors, stable under space environment, a comprehensive materials selection was performed concerning suitable polymer foils, polymer lacquers, reflecting metals, corrosion protection layers, and interference filters. Outgassing tests were performed on polymer foils and lacquers. Twenty-six different flexible optical solar reflectors were manufactured and tested under simulated ground and space environmental conditions. Test results provided the basis for the final selection of two systems for a qualification phase. ESRO

N75-16617# British Aircraft Corp. (Operating) Ltd., Bristol (England).

DUAL-SPIN STABILITY STUDY

M. Brewer, R. Bushell, and N. Swift Paris ESRO Aug. 1974 375 p refs

(Contract ESTEC-1030/70-AA)

(ESRO-CR-471) Avail: NTIS HC $10.00

Aspects of the stability of dual-spin satellite systems were considered and simulated theoretically. In particular, the effect of finite flexibility and non-linearities in the despin bearing on nutational stability, and nutation damper nonlinearities, specifically friction and saturation on the nutational behavior of the system, were investigated. It is shown that platform imbalance couples nutational motion to the despin control system, in such a way that correct design of the control system results in enhanced nutational stability. Energy dissipated within the despin bearing as a result of compliance can be treated as an energy sink basis. For low values of bearing stiffness further unstable modes can exist for non-zero bearing energy dissipation. Despin bearing dead-space or slop can result in a nutational limit cycle, if the slop is associated with the rotor of a prolate satellite. Nutation damper friction can similarly result in a nutational limit cycle. ESRO

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N75-16618# Royal Aircraft Establishment, Farnborough (England).

A VEHICLE BORNE ACCELERATION INTEGRATOR FOR COMPUTING VELOCITY DATA

P. G. Herrington Dec. 1973 59 p refs

(RAE-TR-73126; BR38821) Avail: NTIS HC $4.25

An electronic unit, called an Incremental Velocity Meter, developed to measure the third stage velocity increment of the Black Arrow satellite launching vehicle is described. The Incremental Velocity Meter is used in conjunction with an onboard longitudinal accelerometer. The technique employed is to continually integrate the accelerometer output between limits corresponding to a specified velocity increment. The increments are summed in an accumulator to give the vehicle's total velocity. Although the unit was designed to be compatible with the Black Arrow Type 465 MHz telemetry system, the technique can be adapted for use with other telemetry systems, and the principle of operation can be used with great accuracy to integrate parameters other than acceleration. Author (ESRO)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-16619*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A 20000-HOUR ENDURANCE TEST OF A STRUCTURALLY AND THERMALLY INTEGRATED 5-CM DIAMETER ION THRUSTER MAIN CATHODE
E. G. Wintucky 1975 18 p refs Proposed for Presentation at the 11th AIAA Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975
(NASA-TM-X-71660) Avail: NTIS HC $3.25 CSCL 21C

A 5-cm diameter mercury ion thruster main cathode has completed over 20,000 hours of operation in an ongoing lifetime endurance test. The cathode operating parameters remained at acceptable performance levels throughout the test, the first 9175 hours of which were part of a thruster endurance test. After 20,000 hours, the cathode discharge was easily restarted, the tip orifice indicated negligible erosion and the tip heater showed no degradation. The cathode-isolator- vaporizer assembly, a major thruster subsystem, has thus successfully demonstrated an operational lifetime capability of 20,000 hours, which is the lifetime goal of the 8-cm diameter auxiliary propulsion ion thruster. Author

N75-16620*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
APOGEE MOTOR ROCKETRY RELIABILITY IMPROVEMENTS
J. Behm, W. Dowler, and W. Gin 15 Dec. 1974 28 p refs (Contract NAS7-100)
(NASA-CR-142086; JPL-TM-33-714) Avail: NTIS HC $3.75 CSCL 21H

Since 1963, solid propellant apogee motors have been placing satellites into geosynchronous orbits. Major technological breakthroughs are not required to satisfy future mission requirements; however, there is a need to improve reliability to enhance cost effectiveness. Several management test options are discussed. A summary of results and conclusions derived from review of missions, where failure of a solid motor was inferred, and correlation of system factors with failures are reported. Highlights of a solid motor diagnostic instrumentation study are presented. Finally, recommendations are provided for areas of future apogee motor upgrade, which will increase project cost effectiveness by reducing the potential for future flight failures. Author

N75-16621*# Marquardt Corp., Van Nuys, Calif. Engineering Dept.
OMS ENGINE SHUTOFF VALVE AND ACTUATION SYSTEM DESIGN AND EVALUATION Final Report
H. Wichmann 15 Dec. 1974 202 p refs
(Contract NAS9-13443)
(NASA-CR-141614; S-1316) Avail: NTIS HC $7.25 CSCL 21H

Shutoff valve and actuation system concepts that are most suitable for the Orbital Maneuvering Systems engine application were determined. Emphasis was placed on the ten year and 100 mission life requirement, propellant and propellant residue compatibility and weight. It was found that poppet or ball valves utilizing electric or electropneumatic actuation were most applicable. Preliminary design layouts of a number of valve and actuation concepts were prepared and analyzed to make the optimum concept selection. Pneumatic actuation systems were required to feature their own pneumatic supply so that for the quad redundant valve, it was necessary to include two pneumatic supply systems, one for each of the series legs of the quad redundant package. The requirement for the pneumatic package placed heavy reliability, weight, and maintenance penalties upon electropneumatic actuation systems. The two valve and actuation systems concepts selected featured electric torque motor operation and a poppet as well as a ball valve concept with a retractable seal. Author

N75-16622# Lockheed Missiles and Space Co., Palo Alto, Calif.
SOLID PROPELLANT ROCKET MOTORS
E. S. Fridenson [1975] 12 p Transl. into ENGLISH from the book "Osnovy Raketnoi Tekhniki" Moscow, Voenizdat, 1973 p 56-72
Avail: NTIS HC $3.25 National Translations Center, John Crerar Library, Chicago, Ill. 60616

The design of solid rocket engines is analyzed along with the advantages and disadvantages. The requirements for heavy chamber structures are presented, and modern engines, heat shielding, and engine operation are discussed. The qualities of permanent readiness to launch even after prolonged storage, the reliability, and simplicity of utilization are considered important for military missiles. F.O.S.

N75-16623# Lockheed Missiles and Space Co., Palo Alto, Calif.
CHARACTERISTICS OF EMERGENCY STATES
E. B. Volkov, R. S. Sudakov, and T. A. Syritsyn [1975] 7 p Transl. into ENGLISH from the book "Osnovy Teorii Nadezhnosti Raketnykh Dvigatelei" Moscow, Mashinostr., 1974 p 230-237
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The working, emergency, and failure states of rocket engines are examined with emphasis on the emergency state. The exposure time of engines to the emergency state, and the coefficients of overlapping of emergency states are analyzed. Some types of engine emergencies discussed include: spoilage of mainlines, and gas containers; imperfections in automation elements; pump cavitation; and high frequency oscillations. F.O.S.

N75-16624*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF CONSTRUCTING DISHED ION THRUSTER GRIDS TO PROVIDE HOLE ARRAYS SPACING COMPENSATION Patent Application
Bruce A. Banks, inventor (to NASA) Filed 20 Jan. 1975 12 p
(NASA-Case-LEW-11876-1; US-Patent-Appl-SN-542157) Avail: NTIS HC $3.25 CSCL 21C

Hydroforming matched grids for an accelerator system of an ion thruster is described. The accelerator grid is stretched prior to hydroforming so that the center-to-center spacing of the whole array in the accelerator grid is larger than the screen grid. Stretching of the accelerator grid is done in a manner that uniformly stretches the grid in all directions in the plane of the grid. The center-to-center spacings of a photoresist pattern for an array of holes applied to a thin metal sheet are increased by uniformly stretching the thin metal sheet in all directions along the plane of the sheet. The uniform stretching is provided by securely clamping the periphery of the sheet and applying an annular force against the face of the sheet, within the periphery of the sheet and around the photoresist pattern. The technique is used in the construction of ion thruster grid units wherein the outer or downstream grid is subjected to uniform stretching prior to convex molding. The technique provides alignment of the holes of grid pairs so as to direct the ion beamlets in a direction parallel to the axis of the grid unit and thereby provide optimization of the available thrust. NASA

N75-16625*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
SUMMARY OF NOZZLE-EXHAUST PLUME FLOWFIELD ANALYSES RELATED TO SPACE SHUTTLE APPLICATIONS
Morris M. Penny Jan. 1975 21 p refs
(Contract NAS9-13429)
(NASA-CR-141626; LMSC-HREC-TR-D390661) Avail: NTIS HC $3.25 CSCL 21B

Exhaust plume shape simulation is studied, with the major effort directed toward computer program development and analytical support of various plume related problems associated with the space shuttle. Program development centered on (1) two-phase nozzle-exhaust plume flows, (2) plume impingement, and (3) support of exhaust plume simulation studies. Several studies were also conducted to provide full-scale data for defining exhaust plume simulation criteria. Model nozzles used in launch vehicle test were analyzed and compared to experimental calibration data. Author

N75-16626*# Alabama A & M Univ., Huntsville. School of Technology.
ROCKET ENGINE THRUST CHAMBER HEAT TRANSFER CALCULATION AND ANALYSIS Final Report
Hrishikesh Saha Sep. 1974 55 p refs
(Grant NGR-01-001-024)

(NASA-CR-142178) Avail: NTIS HC $4.25 CSCL 21H

A parametric study of the heat transfer rate along the wall of a rocket nozzle is presented. The influences of different parameters; laminar and turbulent Lewis number, mixture ratio, initial wall temperature distribution, and eddy viscosity, were considered. The numerical evaluation of these influences on heat transfer rate was done by using three different compressible, reacting laminar and turbulent boundary layer computer programs; MABL (Mass Addition Boundary Layer Program), MABL-KE (MABL program is modified to include turbulent kinetic energy equation), and BLIMP (Boundary Layer Integral Matrix Procedure). This study also provided an excellent opportunity to evaluate the efficiencies of these three computer programs and to suggest one of them for future computational purposes. Author

N75-16627# Rocket Propulsion Establishment, Westcott (England).

PERFORMANCE TESTING OF A 3 kW HYDROGEN RESISTOJET

J. A. Donovan and W. T. Lord May 1973 15 p refs Presented at Elec. Propulsion for Space Vehicles Conf., Culham, Engl., 10-12 Apr. 1973

(RPE-TN-237; BR41610) HC $3.25

The hydrogen resistojet J3 was successfully tested at full design mass flow and full power. It produces an effective exhaust velocity (thrust per unit mass flow) of 7.57 km/s at an overall efficiency (kinetic power per unit total power) of 0.681. Its measured properties near the design point are close to design predictions, the discrepancies being within the combined uncertainties of the theoretical methods and experimental techniques. The results at full mass flow and full power are supported by comprehensive measurements at lower powers, and by measurements at one-tenth design mass flow, which show little scatter and are entirely self-consistent. Author (ESRO)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-16628 British Library Lending Div., Boston Spa (England).

X-RAY FLUORESCENCE ANALYSIS OF SULPHUR IN COAL

J. Frigge 3 Dec. 1973 14 p refs Transl. into ENGLISH from Erdoel Kohle (Hamburg), v. 25, no. 8, Aug. 1972 p 447-451

(BLL-CE-Trans-6134-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The effects of particle size and sulfur-coal bonds on X-ray fluorescence analysis of sulfur in coal were investigated. A method is described for determining sulphur and various other lighter elements in coal with ash contents up to about 10%. It was found that with the same overall composition, the fluorescence intensity of a preparation depends on the concentration of the element investigated and on the size, shape, and orientation of the particles which make up the preparation. Author

N75-16629# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).

REACTIONS OF UREA, SEMICARBAZIDE AND CARBAZIDE [REAKTIONEN VON HARNSTOFF, SEMICARBAZID UND CARBOHYDRAZID]

W. Engel 31 Dec. 1973 42 p refs In GERMAN

(ICT-2/73) Avail: NTIS HC $3.75

Reaction products of urea, semicarbazide and carbazide, with their respective acid salts, were investigated in melts by differential thermal analysis and in aqueous solution. Urea hydrochloride in melts yields biuret and an amount of hydrocyanic acid, increasing with temperature. Equimolecular mixtures of semicarbazide and its hydrochloride yield biurea both in melts and aqueous solution. Molten mixtures of carbazide and carbazide hydrochloride yield up to 76% aminourazol, while in aqueous solution only small amounts are formed. ESRO

N75-16630# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).

REACTIONS OF SEMICARBAZIDE WITH CARBAZIDE [REAKTIONEN VON SEMICARBAZID MIT CARBOHYDRAZID]

W. Engel 31 Dec. 1973 30 p refs In GERMAN

(ICT-8/73) Avail: NTIS HC $3.75

Reactions of semicarbazide and carbazide were studied, both in melts and in aqueous solution. Presence of aqueous medium, or excess of either reactant, or reaction of one or the other in its acid salt form, give way to reaction products differing both qualitatively and quantitatively. Semicarbazide and carbazide react in the melt to carbamide and, further, to the hydrazide salt of aminourazol. If, instead, semicarbazide hydrochloride is reacted, biurea appears in the melt. Carbazide excess brings about carbazide carbamide. Differential thermal analysis was used to monitor reactions in the melt. ESRO

24 COMPOSITE MATERIALS

Includes laminates.

N75-16631 British Library Lending Div., Boston Spa (England).

MEASUREMENT OF THE MOISTURE CONTENT OF INSULATING MATERIALS USING THE KARL FISCHER METHOD

T. Cserfalvi 30 Oct. 1973 19 p refs Transl. into ENGLISH from Elektrotechnika (Budapest), v. 65, no. 5, 1972 p 169-174

(BLL-CE-Trans-6216-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The Karl Fischer method for moisture content determination of insulating materials is described. The method is a volumetric analytical technique based on distillation and is equally suitable for both mineral oil and paper determinations. Direct and indirect titration methods are also discussed. Author

N75-16632 British Library Lending Div., Boston Spa (England).

SURFACE TREATMENT OF TITANIUM OXIDE. 1: ESTERIFICATION

S. Okazaki and T. Kanno Mar. 1974 20 p refs Transl. into ENGLISH from Nihon Kagaku Kaishi (Japan), v. 7, 1973 p 1285-1290

(BLL-RTS-8873) Avail: British Library Lending Div., Boston Spa, Engl.: 6 BLL photocopy coupons

The extent and effects of surface esterification were investigated for the reaction of the intermediate (hydrated titanium oxide) in the production of TiO2 by the sulphuric acid process, and of commercial anatase-type titanium oxide, with methanol, ethanol, n-propanol, n-butanol, and n-octanol in an autoclave at 230-280 C. Analysis of the carbon content, IR spectra, TGA and DTA of the products showed that the sulphuric acid process intermediate, which contained a large number of OH groups on the surface, gave the highest conversion; investigation of the reaction with butanol up to 280 C showed that the conversion was greater the higher the temperature. However, the conversion fell, with the formation of olefin instead, when the reaction was continued for prolonged periods above 220 C. There was little difference in reactivity between the alcohols; the lipophilic effect increased with increasing alcohol chain length. Author

N75-16633 British Library Lending Div., Boston Spa (England).

COHESION OF SPHERICAL PARTICLES WITH SLEEVES OF CaO - SiO2 - Al2O3 MELTS

V. A. Deryabin, S. I. Popel, and Yu. A. Deryabin 1974 12 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 7, 1974 p 15-17

(BLL-M-25035-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The capillary cohesive forces of molybdenum spheres with layers of CaO-SiO2-Al2O3 slag were measured. They amount to 200-600 dyne, decrease with increasing distance between the particles and do not change evenly as a function of the magnitude of surface tension and the volume of the sleeve. With 40 mol% of CaO, a decrease in surface tension with rising SiO2 at the expense of Al2O3 with a specific sleeve volume leads to a rise

in the binding force, owing to increasing average curvature of the meniscus. With small clearances the increase in volume of liquid causes a decrease in the binding force, (especially for melts with a high tension) and an increase in this force is obtained with large clearances. The rate of weakening of the bond with separation of the particles rises with decreasing volume of the sleeve. Author

N75-16634*# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
EVALUATION OF SOFT RUBBER GOODS Final Report, Jul. 1972 - Feb. 1974
P. L. Merz Feb. 1974 203 p refs
(Contract NAS8-29060)
(NASA-CR-120608; CASD-NAS74-008) Avail: NTIS HC $7.25 CSCL 11D

The performance of rubber goods suitable for use as O-rings, seals, gaskets, bladders and diaphragms under conditions simulating those of the space shuttle were studied. High reliability throughout the 100 flight missions planned for the space shuttle was considered of overriding importance. Accordingly, in addition to a rank ordering of the selected candidate materials based on prolonged fluid compatibility and sealability behavior, basic rheological parameters (such as cyclic hysteresis, stress relaxation, indicated modulus, etc.) were determined to develop methods capable of predicting the cumulative effect of these multiple reuse cycles. Author

N75-16635*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LIGHTWEIGHT ELECTRICALLY POWERED FLEXIBLE THERMAL LAMINATE Patent Application
Frederic S. Dawn and Dale G. Sauers, inventors (to NASA) Filed 14 Jan. 1975 8 p
(NASA-Case-MSC-12662-1; US-Patent-Appl-SN-540779) Avail: NTIS HC $3.25 CSCL 11D

A lightweight flexible laminate structure for providing controlled heating is described. It is composed of filling yarns and warp-yarns which are preferably interwoven. The filling strands are electrically nonconductive multifilament yarns, and the warp-yarns are composed of electrically conductive metal filaments or fibers which can be resistance heated by the application of an electrical voltage. The nonconductive yarns provide mechanical strength and preclude the passage of electrical current between metal yarns by assuring minimum spacing. A plastic film is bonded to the matrix of the yarns and performs the function of providing additional strength and preventing connective loss of heat in a nonvacuum application. A metallic film of aluminum, silver, or gold is deposited on the obverse side of the film relative to the matrix and provides uniform heat load distribution. Author

N75-16636*# National Materials Advisory Board, Washington, D.C.
METAL-MATRIX COMPOSITES: STATUS AND PROSPECTS
Dec. 1974 117 p refs Sponsored by NASA
(Contract MDA903-74-C-0167)
(NASA-CR-142191; NMAB-313) Avail: NTIS HC $5.25 CSCL 11D

Applications of metal matrix composites for air frames and jet engine components are discussed. The current state of the art in primary and secondary fabrication is presented. The present and projected costs were analyzed to determine the cost effectiveness of metal matrix composites. The various types of metal matrix composites and their characteristics are described. Author

N75-16637*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
STUDY OF THE COSTS AND BENEFITS OF COMPOSITE MATERIALS IN ADVANCED TURBOFAN ENGINES Final Report, 27 Jun. - 27 Dec. 1973
C. A. Steinhagen, C. L. Stotler, and R. E. Neitzel Oct. 1974 194 p refs
(Contract NAS3-17775)
(NASA-CR-134696; R74AEG418) Avail: NTIS HC $7.00 CSCL 11D

Composite component designs were developed for a number of applicable engine parts and functions. The cost and weight of each detail component was determined and its effect on the total engine cost to the aircraft manufacturer was ascertained. The economic benefits of engine or nacelle composite or eutectic turbine alloy substitutions was then calculated. Two time periods of engine certification were considered for this investigation, namely 1979 and 1985. Two methods of applying composites to these engines were employed. The first method just considered replacing an existing metal part with a composite part with no other change to the engine. The other method involved major engine redesign so that more efficient composite designs could be employed. Utilization of polymeric composites wherever payoffs were available indicated that a total improvement in Direct Operating Cost (DOC) of 2.82 to 4.64 percent, depending on the engine considered, could be attained. In addition, the percent fuel saving ranged from 1.91 to 3.53 percent. The advantages of using advanced materials in the turbine are more difficult to quantify but could go as high as an improvement in DOC of 2.33 percent and a fuel savings of 2.62 percent. Typically, based on a fleet of one hundred aircraft, a percent savings in DOC represents a savings of four million dollars per year and a percent of fuel savings equals 23,000 cu m (7,000,000 gallons) per year. Author

N75-16638# Sandia Labs., Livermore, Calif.
THERMAL EXPANSIONS OF KOVAR AND CERAMVAR AND SEALS OF THESE MATERIALS TO ALUMINA
R. L. Bertolotti Sep. 1974 15 p refs
(Contract AT(29-1)-789)
(SAND-74-8003) Avail: NTIS HC $3.25

Thermal expansions of Ceramvar and Kovar were measured over the range of -180 to +1000 C. These measurements aid in predicting thermal contraction mismatch stresses of Ceramvar- or Kovar-to-alumina seals. These stresses reach a maximum during cool-down from the braze temperature; it is they, rather than room-temperature residual stresses, which are the limiting factor in sealing. The technique of making moly-manganese seals is reviewed briefly. Author (NSA)

N75-16639# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Mfg. Research and Product Development Dept.
TEST METHOD FOR THE DETERMINATION OF THE MASS PER UNIT AREA OF UNCURED RESIN PREIMPREGNATED UNIDIRECTIONAL CARBON FIBRES, PART 1
P. Knies and L. M. Godfried 11 Aug. 1973 91 p
(FOK-R-1707-PT-1) Avail: NTIS HC $4.75

The requirements for testing various characteristics of uncured resin preimpregnated unidirectional carbon fibers are described. Among the properties determined are the mass per unit area, resin content, resin flow, fiber content by weight and volume, volatile content, and tack force. Test methods for the determination of mechanical properties of carbon fiber reinforced plastics are also given. ESRO

N75-17223* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AEROSPACE MATERIALS FOR NONAEROSPACE APPLICATIONS
Robert L. Johnston and Frederick S. Dawn *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 403-444 refs (For availability see N75-17188 08-80)
CSCL 11D

N75-17224* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FIRE-RESISTANT AIRCRAFT MATERIALS DEVELOPMENT AND EVALUATION PROGRAM
Richard W. Bricker and Robert N. Stuckey *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 445-491 refs (For availability see N75-17188 08-80)
CSCL 11D

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N75-16640 British Library Lending Div., Boston Spa (England).
A MATHEMATICAL MODEL OF THE COMBUSTION CHAMBER
I. Zuber 30 Oct. 1973 106 p refs Transl. into ENGLISH from Staatliches Forschungsinstitut fuer Maschinenbau (Bechovice), no. 12, 1972
(BLL-CE-Trans-6200-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.. 11 BLL photocopy coupons

A mathematical model of a combustion chamber was constructed based on equations of energy conservation, mass, and impulse to investigate transfer processes of momentum, heat, and mass, and chemical reactions. Modifications of the basic equations are discussed along with algorithms for solving them. It was found that the grid's roughness causes pseudo-diffusion errors and that the efforts to establish a three-dimensional model led to a direct procedure for solving flow equations and two-dimensional problems. Author

N75-16641 British Library Lending Div., Boston Spa (England).
SODIUM FIRES: FLAME TEMPERATURES AND EXTINGUISHING
J. C. Malet 30 Oct. 1973 20 p refs Transl. into ENGLISH from J. Chim. Phys. (France), v. 70, no. 1, Jan. 1973 p 126-133
(BLL-CE-Trans-6215-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A previous study of the combustion of a bed of liquid sodium as a function of pressure revealed two distinct modes of combustion: One characterized by a blue flame, the other by a yellow flame. The zone of the blue flame and that of the yellow flame, clearly defined for a fuel mixture of oxygen and nitrogen, develops continuously as a function of the molar fraction of oxygen in the mixture and the temperature. The limits of these zones correspond for each temperature to constant partial pressures of oxygen and for both these zones a mode of combustion of sodium and a process of formation of the oxides are proposed. The hypotheses previously formulated for the mode of combustion and the processes of oxide formation for the yellow and blue flames of sodium are confirmed. Author

N75-16642# Australian National Univ., Canberra. Research School of Physical Sciences.
THE SELF-DIFFUSION OF SIMPLE FLUIDS: TABULATED VALUES FOR ARGON AND METHANE
K. R. Harris, R. Mills, H. J. M. Hanley, and L. A. Woolf 1974 38 p refs Sponsored in part by Office of Standard Reference Data
(DRU-RR-2) Avail: NTIS HC $3.75

Data for the self-diffusion coefficients (D) of several simple fluids - He, Ne, Ar, Kr, Xe, CH4, H2, N2, CF4, CO2, and SF6 - in the dense gas and liquid states are reviewed. The general behavior of the self-diffusion coefficient with respect to temperature and density was examined by using the excess function approach. Tabulated values of D for methane and argon are presented as a function of temperature, pressure, and density. The pressure range covered is 2-50 MPa and the temperature range is 170-320 K for methane and 100-250 K for argon. The estimated error of the tabulated coefficients is + or - 10%. Author

N75-16643*# Kanner (Leo) Associates, Redwood City, Calif.
APPLICATION OF QUANTUM MECHANICS METHODS TO THE STUDY OF OXIDATION REDUCTION ELECTROCHEMICAL REACTIONS OF METALS AND SEMICONDUCTORS
L. P. Bicelli Washington NASA Jan. 1975 40 p refs Transl. into ENGLISH from Chim. Ind. (Milan), v. 56, no. 6, 1974 p 439-451
(Contract NASw-2481)
(NASA-TT-F-16131) Avail: NTIS HC $3.75 CSCL 07D

After a discussion of oxidation-reduction reactions and the tunneling effect in general, the distribution of quantum states as a function of their energy in terms of quantum state density, exchange equilibrium conditions, anodic and cathodic polarization, limiting currents and overvoltage-current relationships are discussed. The intrinsic properties of the semiconductor and the electrolyte's oxidation-reduction voltage determine whether the transfer occurs predominantly at the valency band or at the conduction band. Author

N75-16644*# Kanner (Leo) Associates, Redwood City, Calif.
POLAROGRAPHIC ANALYSIS OF OXIDE MIXTURES IN MELTS
N. N. Sevryukov, K. A. Skurupafis, and M. T. Kintana Washington NASA Jan. 1975 8 p refs Transl. into ENGLISH from Zavod. Lab. (USSR), v. 40, no. 4, 1974 p 373-375
(Contract NASw-2481)
(NASA-TT-F-16140) Avail: NTIS HC $3.25 CSCL 07D

Conditions for the polarographic determination of several cations Zn(2+), Pb(2+), Cu(2+), and Cd(2+) and for the lanthanides La(3+), Pr(3+), Gd(3+), and Dy(3+) in an ammonium nitrate melt were determined. The potentials of peaks of the polarograms for these cations in the ammonium nitrate melt are given. Data on the determination of lanthanum, rare-earth elements, and zinc in mixtures with various oxides are presented. Since cerium dioxide does not react with ammonium nitrate, a method was developed for determining lanthanides in the presence of cerium dioxide, using an ammonium nitrate melt. The sensitivity of the method depends on the completeness of removal of moisture from the melt by electrolysis. The minimum amount of lanthanides that can be reliably determined is about 0.0015 g-ion/kg of melt (or about 0.006 g in the polarographic cell used). Author

N75-16645*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXHAUST EMISSIONS OF A DOUBLE ANNULAR COMBUSTOR: PARAMETRIC STUDY
Donald F. Schultz Washington Feb. 1974 44 p refs
(NASA-TM-X-3164; E-8084) Avail: NTIS HC $3.75 CSCL 21B

A full scale double-annular ram-induction combustor designed for Mach 3.0 cruise operation was tested. Emissions of oxides of nitrogen, carbon monoxide, unburned hydrocarbons, and smoke were measured over a range of combustor operating variables including reference velocity, inlet air temperature and pressure, and exit average temperature. ASTM Jet-A fuel was used for these tests. An equation is provided relating oxides of nitrogen emissions as a function of the combustor, operating variables. A small effect of radial fuel staging on reducing exhaust emissions (which were originally quite low) is demonstrated. Author

N75-16646# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE EXTINCTION OF STATIONARY BURNING POWDER BY A THERMAL RADIATION PULSE
Iu. A. Gostintsev [1975] 4 p refs Transl. into ENGLISH from Fiz. Goren. i Vzryva, (USSR), v. 10, no. 5, 1974 p 764-767
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The effects of a trapezoidal pulse of penetrating monochromatic light radiation on burning powder are examined. The results indicate that combustion can be extinguished under certain conditions. N.E.R.

N75-16647*# Scientific Translation Service, Santa Barbara, Calif.
ELECTROLYTIC RECOVERY OF SODIUM FROM SODIUM-CONTAINING ORGANOALUMINUM COMPOUNDS
K. Ziegler, H. Lehmkuhl, and W. Grimme Washington NASA Feb. 1975 30 p Transl. into ENGLISH from German Patent no. 1114330 (Appl., 6 May 1959) 9 p
(Contract NASw-2483)
(NASA-TT-F-16175) Avail: NTIS HC $3.75 CSCL 07D

Molten NaAlEt4 or a related organic complex is electrolyzed in an inert gas at 100-160 deg in a closed cylindrical cell of enameled sheet steel, with a central cathode and a concentric anode of Fe or Cu gauze. Molten Na collects on the cathode, trickles downwardly, and collects in the bottom of the cell. The

complex radical separates at the anode, where it is decomposed into Et3Al and a mixture of equal volumes C2H4 and C2H6 (or analogous products from other complexes). If the Et3Al is permitted to diffuse to the cathode, it reacts with the separated Na, exchanging Al for Na in regenerating electrolyte. Author

N75-16648*# Kanner (Leo) Associates, Redwood City, Calif.
WATER TRANSPORT ACROSS CATION-EXCHANGE MEMBRANE. 1: EXPERIMENTAL TECHNIQUE. INFLUENCE OF THE CONCENTRATION AND TEMPERATURE ON THE WATER TRANSPORT NUMBER
M. Demarty, A. Maurel, and E. Selegny Washington NASA Mar. 1975 24 p refs Transl. into ENGLISH from J. Chim. Phys. (Paris), v. 71, no. 6, 1974 p 811-818
(Contract NASw-2481)
(NASA-TT-F-16169) Avail: NTIS HC $3.25 CSCL 07D

An automatic technique was developed for measuring electroosmotic flows. It was applied to measurement of water transport numbers of two cation-exchange membranes under the influence of various parameters. The results show a strong dependence between water transport number and concentration in the range 0.01 to 1 N. The nature of the ion is important, while the influence of the temperature is small (about 0.1% per degree at 25-80 C. Measured water transport numbers were compared with those calculated according to Manning's model in the case of sodium chloride at different concentrations. It was found that the model gives satisfactory agreement between the experimental and calculated values. Author

N75-16649*# Scientific Translation Service, Santa Barbara, Calif.
THE KINETICS OF OXIDATION-REDUCTION OF VANADIUM IONS ON VARIOUS ELECTRODES
V. G. Stepanenko and S. P. Antonov Washington NASA Feb. 1975 9 p refs Transl. into ENGLISH from Ukr. Khim. Zh. (Ukainia SSR), v. 40, no. 6, 1974 p 582-585
(Contract NASw-2483)
(NASA-TT-F-16167) Avail: NTIS HC $3.25 CSCL 07D

The existence was examined of inhibited phases preceding the electron transfer phase in the oxidation-reduction of vanadium ions on various electrodes. The experimental conditions are described in detail. Author

N75-16650# Harvard Univ., Cambridge, Mass.
THE HOME FIRE PROJECT Semiannual Progress Report
H. W. Emmons and R. Friedman Dec. 1974 55 p refs Presented at the Armstrong Cork Symp. on Full-Scale fire testing, Lancaster, Pa., 11-12 Nov. 1974 Prepared in cooperation with Factory Mutual Res. Corp., Norwood, Mass.
(Grant NSF GI-34734)
Avail: NTIS HC $4.25

A program is described which consists of tasks directed to the development of an understanding of fire and its control. Topics discussed include the feasibility of pressure modeling in transient wood crib fires, radiative properties of multiple turbulent flames, fan anemometers, pyrolysis products of cellulose, charcoal fires, improved quantitative fire investigations and instruments, and burning rates. M.J.S.

N75-16651# Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
POSSIBILITIES FOR LITHIUM BOROHYDRIDE RECYCLE
E. E. Filby Jun. 1974 27 p refs
(Contract AT(10-1)-1375)
(ICP-1054) Avail: NTIS HC $3.75

The use of lithium borohydride as a portable source of hydrogen fuel gas is considered. Would it be possible to chemically recycle the lithium borate byproduct of the hydrogen generation reaction, and if so, how? An outline of pertinent boron chemistry shows numerous possible intermediate reaction sequences, and two apparently reasonable recycle routes. One of these uses methyl borate as an intermediate and is closest to a true cycle in that it consumes only hydrogen and produces only water in regenerating the borohydride. The other sequence, using a diborane intermediate, is heavily favored thermodynamically. It consumes hydrogen, carbon, and oxygen and produces water and carbon dioxide. Author (NSA)

N75-16652# Oxford Univ. (England). Dept. of Engineering Science.
NIPROP: A COMPUTER PROGRAMME FOR THE THERMODYNAMIC AND THERMOPHYSICAL PROPERTIES OF NITROGEN
B. A. Hands and M. V. Goodwin Jun. 1974 85 p refs
(Rept-1082/74) Avail: NTIS HC $4.75

The thermodynamic properties were derived from an equation of state valid from about the melting line to 1950 K, and up to 10 to the 9th power N/sq m. Pressure, enthalpy, entropy, and thermodynamic coefficients were calculated by analytical differentiation and integration. Equations are provided for saturation properties. Programs were written for the velocity of sound and the Joule-Thompson coefficient, and also for calculating any thermodynamic coordinate once two others are defined. Equations for surface tension, viscosity, thermal conductivity, refractive index, and dielectric constant have been included. Subprograms are explicitly listed. ESRO

N75-16653# Rocket Propulsion Establishment, Westcott (England).
IGNITION AND COMBUSTION IN SITU OF OIL FROM WRECKED OIL TANKERS: SMALL SCALE BURNING TESTS CARRIED OUT AT THE RPE
J. Diederichsen, A. R. Hall, and P. T. Hinde Jul. 1972 46 p refs
(RPE-TM-616; BR39888) Avail: NTIS HC $3.75

The effect of the size and position of venting apertures on the burning rate of crude oil in model tanks was determined. One side aperture and one lid aperture were used in all tests, only their size and relative positions being changed. The effect of wind speed on the burning rate was also investigated, burnings being performed in still air and in blower-generated winds of approx. 6 and 11 m/s. Tanks of three different sizes were used, the largest being of 1 sq m plan cross-sectional area, in an attempt to predict from the burning rates found in small scale tests those to be expected in a much larger tank. The tanks were water cooled on the bottom and on one side to simulate conditions at sea. Some empirical extrapolations and scaling rules were obtained which provide an estimate of the probable burning rate in ship-sized tanks under various conditions of wind and venting. Author (ESRO)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-16654 Polish Academy of Sciences, Warsaw.
INVESTIGATING MATERIAL DEFECT IN THE FATIGUE PROCESS ON THE BASIS OF DYNAMIC PROPERTY CHANGES [BADANIE STOPNIA USZKODZENIA MATERIALU W PROCESIE ZMECZENIA NA PODSTAWIE ZMIAN WLASNOSCI DYNAMICZNYCH]
Stefan Ziemba and Bohdan Rysinski 30 Apr. 1973 21 p refs In POLISH
(Rept-23/1973) Avail: Issuing Activity

Substructural and structural fatigue mechanisms were investigated, taking into account the influence of technological, construction, and usage parameters on fatigue properties. The formation and development of defects within material subjected to variable loading is analyzed. Other topics discussed include the durability of construction elements under variable load and environment conditions, and internal factors such as temperature and medium type. Transl. by M.J.S.

N75-16655 British Library Lending Div., Boston Spa (England).
EFFECT OF GRAIN SIZE ON OXIDATION OF AUSTENITIC STAINLESS STEELS IN STEAM
M. Kowaka and S. Nagata Feb. 1974 14 p refs Transl. into ENGLISH from J. Japan Inst. Metals (Sendai), v. 36, no. 5, 1972 p 486-492
(BLL-CE-Trans-6342-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The oxidation of austenitic stainless steel by superheated steam is studied in relation to the use of this material for

superheater tubes in thermal power generation boilers and in nuclear power generation. Trouble is encountered with the formation of scale on the inner surface of the austenitic stainless steel used in superheater tubes for industrial boilers, leading to decreased heat transfer, rise in tube wall temperature, and ejection of detached scale into turbines or its accumulation at bends. A solution to this problem is sought by investigating the factors responsible for steam oxidation in contemporary stainless steels. A distinct pattern is discovered in the effect of grain size and the ease of detachment of the related scale.
Author

N75-16656 British Library Lending Div., Boston Spa (England).
MECHANISM OF EROSION CORROSION IN FAST-FLOWING LIQUIDS
C. Loss 30 Oct. 1973 27 p refs Transl. into ENGLISH from Werkstoffe Korrosion (Weinheim), v. 24, Jan. 1973 p 38-48
(BLL-CE-Trans-6246-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The corrosion behavior of copper, brass and gray cast iron was studied in 3% air-saturated NaCl solution and seawater respectively. At low and very high flow rates, the corrosion rate clearly depends on the flow. Above certain critical flow rates, attack is localized and erosion corrosion is found at high turbulence spots. By electrochemical methods the particular corrosion rates are determined and it is shown that the cathodic partial corrosion reaction is rate-controlling. The origin of erosion corrosion is due not only to mechanical interaction between the medium and the metal surface but also to processes occurring within the covering layer.
Author

N75-16657 British Library Lending Div., Boston Spa (England).
ELECTRON MICROSCOPIC STUDY OF DEFECTS CREATED IN METALS BY ION IMPLANTATION
M. O. Ruault 4 Feb. 1974 15 p refs Transl. into ENGLISH from the French
(BLL-CE-Trans-6341-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Ion implantation in a target is accompanied by the creation of point defects causing pile-ups (dislocation loops, tetrahedrons of stacking faults, bubbles) to be formed which are observed in an electron microscope. The depth distribution of these defects is theoretically different from that of the implanted ions and the positions of the maxima depend on the energy and the nature of the ions used, the nature of the target, and the implantation direction. The depth distribution of the defects, their geometry, and their nature are studied by electron microscope to ascertain if it is of the vacancy or interstitial type. Gold polycrystals were used as metal targets to study (1) the effect of an electron bombardment on a previously implanted sample, (2) to supplement studies of hyperfine interactions, and (3) to study electron irradiation in gold polycrystals which had not been implanted. Results obtained confirm the interstitial nature of the defects.
Author

N75-16658 Polish Academy of Sciences, Warsaw.
FORMATION OF MICROFISSURES ON GRAIN BOUNDARIES IN DEFORMED METALS [ZARODKOWANIE MIKROSZCZELIN NA GRANICACH ZIARN W ODKSZTALCONYCH METALACH]
Kazimierz Derlacki 7 Dec. 1973 49 p refs In POLISH
(Rept-49/1973) Avail: Issuing Activity

The influence of a vacancy on the strength of a metal polycrystal found in a uniaxial state of deformation was examined. Interstitials of a polycrystal including a grain boundary are considered along with the conditions necessary for microfissure formation on this boundary. The problem is quantitatively analyzed by using vacancies (crystal defects). Tests were conducted on such metals as copper, aluminum, and steel.
Transl. by M.J.S.

N75-16659 British Library Lending Div., Boston Spa (England).
EFFECTS OF THE CONDITIONS UNDER WHICH 9Kh18 STEEL IS GROUND ON ITS EXOELECTRONIC EMISSION
V. S. Kortov, E. A. Plekhanova, V. D. Ostapenko, and A. I. Gaprindashvili 1974 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 6, 1974 p 116-118
(BLL-M-25019-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The exoemission from 9Kh18 steel specimens after grinding with different depths of metal removed per pass is measured in a vacuum of 0.00001 mmHg with a secondary electron multiplier and photothermal stimulation. Increasing the depth of metal removed altered the exoemission parameters, which correlates with the results of X-ray structural analysis and can be explained by the change, during grinding, in the phase composition of the surface layers of steel. Altering the conditions under which 9Kh18 steel is ground also alters the thermal stability of the structural defects which form.
Author

N75-16660*# Westinghouse Astronuclear Lab., Pittsburgh, Pa.
DEVELOPMENT OF ADVANCED HIGH STRENGTH TANTALUM BASE ALLOYS. PART 2: SCALE-UP INVESTIGATION Final Report
R. L. Ammon and R. W. Buckman, Jr. Jul. 1970 60 p refs
(Contract NAS3-10939)
(NASA-CR-120931; WANL-M-FR-72-001-Pt-2) Avail: NTIS HC $4.25 CSCL 11F

Three experimental tantalum alloy compositions containing 14-16% W, 1% Re, 0.7% Hf, 0.025% C or 0.015% C and 0.015% N were prepared as two inch diameter ingots by consumable electrode vacuum arc melting. The as-cast ingots were processed by extrusion and swaging to one inch and 0.4 inch diameter rod and evaluated. Excellent high temperature forging behavior was exhibited by all three compositions. Creep strength at 2000 F to 2400 F was enhanced by higher tungsten additions as well as substitution of nitrogen for carbon. Weldability of all three compositions was determined to be adequate. Room temperature ductility was retained in the advanced tantalum alloy compositions as well as a notched/unnotched strength ratio of 1.4 for a notched bar having a K sub t = 2.9.
Author

N75-16661# Aeronautical Research Labs., Melbourne (Australia).
FATIGUE OF D6ac STEEL SPECIMENS: MEANS AND VARIABILITIES UNDER PROGRAMMED LOADING
G. S. Jost and G. P. Esson Apr. 1974 26 p refs
(ARL/SM-NOTE-349) Avail: NTIS HC $3.75

The crack initiation and crack growth characteristics of D6ac steel specimens fatigue tested under two programmed loading sequences are compared. The data indicate a strong correlation between variability in crack growth rate and magnitude of the crack growth exponent, and a predicted relation between variances for data conforming to the Paris crack growth law is shown to be generally satisfied.
Author

N75-16662# Oak Ridge National Lab., Tenn.
CORROSION OF SEVERAL IRON- AND NICKEL-BASE ALLOYS IN SUPERCRITICAL STEAM AT 1000 F
H. E. McCoy and B. McNabb Aug. 1974 34 p
(Contract W-7405-eng-26)
(ORNL-TM-4552) Avail: NTIS HC $3.75

The corrosion of several iron- and nickel-base alloys in supercritical steam at 3500 psi and 1000 F was measured to 15,000 h. Corrosion was measured almost entirely by weight change and visual appearance; a few samples were evaluated by more descriptive analytical techniques. The corrosion rates of low alloy ferritic steels containing from 1.1 to 8.7% Cr differed by less than a factor of 2 in steam, but the rates varied drastically in air at 1000 F. Several modified compositions of Hastelloy N were evaluated and found to corrode at about equivalent rates; however, some compositions did corrode intergranularly. Of the alloys studied, the lowest weight gain in 10,000 h was 0.01 mg/sq cm for Inconel 718 and the highest 10 mg/sq cm for the low alloy ferritic steels.
Author (NSA)

N75-16663# Argonne National Lab., Ill.
ELEVATED-TEMPERATURE TRUE STRESS-TUBE STRAIN TENSILE BEHAVIOR OF AISI TYPE 304 STAINLESS STEEL
D. R. Diercks and W. F. Burke Dec. 1973 25 p refs Presented at the Pressure Vessels and Piping-Mater.-Nucl. Conf., Miami Beach, Fla., 24-28 Jun. 1974 Sponsored by AEC
(Conf-740606-20) Avail: NTIS HC $3.25

Data were obtained at true axial strain rates of 4 x 0.001, 4 x 0.001, and 4 x 0.000001 s/1, and temperatures of 900,

1000, 1100, 1200, and 1300 F. A modified closed loop hydraulically activated fatigue testing machine with hourglass specimens and diametral extensometry was used. Results indicate that the true stress at a given strain tends to decrease with an increase in temperature and a decrease in strain rate, particularly at the higher temperatures. The true axial strain to failure and the percent reduction of area are found to be significantly less for all temperatures at the slowest strain rate. The true stress true strain data could be fit over most of the strain range using a modified form of an empirical equation suggested by Stowell. The Hollomon equation was applicable to a smaller strain range, and values for the strength coefficient and strain hardening exponent in this strain range were obtained. Author (NSA)

N75-16664# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
DEFORMATION PROCESSES IN REFRACTORY METALS
Progress Report, 1 Dec. 1973 - 30 Nov. 1974
J. R. Donoso and R. E. Reed-Hill 1974 42 p refs
(Contract AT(40-1)-3262)
(ORO-3262-34) Avail: NTIS HC $3.75

Work was mostly concerned with the stress-strain behavior of Nb, as affected by dynamic strain aging. Also, an investigation of the effect of grain size on the work hardening phenomena associated with dynamic strain aging in Ti is being carried out. The dislocation structure in the dynamic strain aging region in Ti was studied, with the aid of transmission electron microscopy. NSA

N75-16665# Atomic Energy Research Establishment, Harwell (England). Materials Development Div.
COMPENDIUM OF REFERENCES TO STUDIES OF THE PROPERTIES OF LIQUID METAL BINARY SYSTEMS WHICH RELATE TO THEIR STRUCTURE
B. W. Mott and K. Stevenson Jun. 1974 56 p refs
(AERE-Bib-151B) Avail: AEC Depository Libraries HC $6.00; UK £1.00

References associated with about 210 binary alloys are presented. Marginal letter markings are included with each reference to designate the properties investigated. (JRD) NSA

N75-16666# Hanford Engineering Development Lab., Richland, Wash. Materials Engineering Dept.
HIGH STRAIN RATE TENSILE PROPERTIES OF 20 PERCENT CW TYPE 316 STAINLESS STEEL
J. M. Steichen Jun. 1974 37 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-74-39) Avail: NTIS HC $3.75

Testing was performed on portotypic FTR fuel cladding and rod specimens. Test parameters included temperatures from room temperature to 1600 F and strain rates from 3 x 10 to the minus 5th power to 10 in./in./ sec. At test temperatures to 1000 F, the strength and ductility were largely insensitive to strain rate. At temperatures of 1200 F and above, strength properties and uniform elongation were observed to increase and total elongation to decrease with increasing strain rate. Thermal aging at 1200 F for durations to 10,000 hours slightly reduced the strength and increased the ductility of the subject material without significantly altering the strain rate sensitivity. Author (NSA)

N75-16667# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
PRECISION MEASUREMENTS OF GRID CONSTANTS OF DOPED AMMONIUM NITRATE [PRAEZISIONSMESSUNGEN DER GITTERKONSTANTEN VON DOTIERTEM AMMONIUMNITRAT]
W. Engel 31 Dec. 1973 16 p refs In GERMAN
(ICT-3/73) Avail: NTIS HC $3.25

High precision X-ray diffraction measurements were performed on pure ammonium nitrate and diamine copper (11) doped ammonium nitrate to investigate phase stabilization. Results show that doping brings about lattice deformation. Cell constants a and c grow smaller, whereas constant b increases. The tetragonal modification 2 should be favored by a change of the ab surface towards a quadratic shape. ESRO

N75-16668# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Metallique.
LOW CYCLE FATIGUE BY LOAD CYCLING
Robert Vancrombrugge Sep. 1974 19 p Sponsored by Inst. pour l'Encour. de la Rech. Sci. dans l'Ind. et l'Agr.
(CRIF-MT-95) Avail: NTIS HC $3.25

Load cycling fatigue of a medium strength steel was investigated in the flat range of the strain-number of cycles curve for a number of cycles smaller than 2000 and, in one case, up to 1,000,000. A double action hydraulic testing machine with a servo valve and feedback command, allowing cycling between two constant loads, was used. Observed phenomena are described. Scatter and distribution of results, programmed fatigue and Miners law, and the influence of frequency are discussed. ESRO

N75-16669# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
THERMODYNAMICS OF METAL EVAPORIZATION BY SOLID-STATE BODY SHOCK WAVES [THERMODYNAMIK DER METALLVERDAMPFUNG DURCH FESTKOERPERSTOSSWELLEN]
Klaus Hornung Jun. 1974 294 p refs In GERMAN
(MPI-PAE/Extraterr-100) Avail: NTIS HC $8.75

The evaporation of compressible metals under the influence of shock waves was studied. The thermodynamics of the phase equilibrium up to the critical point, and the non equilibrium expansion of the two-phase mixture into vacuum are discussed. The situation behind the shock waves from solids at high pressure and high temperature is studied, and the production of fast two-phase jets in hollow charges is discussed. ESRO

N75-16670# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
AN INVESTIGATION OF CRACK RESISTANCE IN FACE SHEETS OF SANDWICH PANELS
G. Bartelds and A. Nederveen Sep. 1973 38 p Sponsored by the Directorate of Mater. Air, RNLAF
(NLR-TR-73129-U) Avail: NTIS HC $3.75

Sandwich panels provided with a central saw cut in one face layer were fatigue tested to study crack growth up to a predetermined length. Static residual strength was determined subsequently. Crack growth rates and residual strength are compared with similar data for face sheet material. An increased resistance, against both stable fatigue crack growth and unstable crack extension at the failure load, that is two to three times larger than that predicted by linear fracture mechanics methods was observed. The residual strength of such panels may be less than 2/3 of basic panel strength for crack aspect ratios of .05 only. The present results suggest the application of crack stoppers to the face sheets. Author (ESRO)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-16671 British Library Lending Div., Boston Spa (England).
METHODS OF EVALUATING PLASTICS BY EXPOSURE TESTS, THE COLORIMETRIC APPROACH
Toshio Hirai 1974 16 p Transl. into ENGLISH from Japan Plastics, v. 23, no. 5, 1972 p 24-30
(BLL-M-23286-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Colorimetric techniques used in the evaluation of weatherability and the relationship between color measurement and methods of appraisal are reviewed. An account is given of the research carried out by the Plastic Building Materials Council along with results of secondary weatherability tests in regard to the applications of color measurement. Author

N75-16672 British Library Lending Div., Boston Spa (England).
STRUCTURAL DEFECT RESEARCH GaAs SINGLE CRYSTALS WITH THE AID OF THE IR MICROSCOPE

M. Schulz and S. Sarodnik Nov. 1974 11 p refs Transl. into ENGLISH from Rept. issued by the Semiconductor Works Frankfurt/Oper, Stahnsdorf Works, The Karl Marx Univ.(Leipzig) 11 Jul. 1973
(BLL-Trans-3157-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

IR treatments on Chochralski GaAs single crystals, doped with different elements, are described. Auto-decoration of the dislocation was observed when silicon and chromium were used as dopes. The geometric arrangement and the distribution of the dislocation is explained with reference to several examples.
Author

N75-16673# Explosives Research and Development Establishment, Waltham Abbey (England).
ENVIRONMENTAL FAILURE OF STRUCTURAL ADHESIVE JOINTS: A LITERATURE SURVEY
A. J. Kinloch Aug. 1973 28 p refs
(ERDE-TN-95; BR41646) Avail: NTIS HC $3.75

The published literature concerning the failure of structural adhesive joints in hostile environments is reviewed, concentrating on the effects of the universal hostile environment - water. The influence of such features as the adhesive, curing agent, degree of cure, substrate employed and its surface preparation on the durability of structural joints is discussed and possible mechanisms of failure considered. Author (ESRO)

N75-16674# Technische Hochschule, Aachen (West Germany). Lab. fuer Ultraschall.
INVESTIGATION OF THE ULTRASONIC THERMAL INFLUENCE ON THE YIELD BEHAVIOR OF PLASTICS Final Report [UNTERSUCHUNGEN UEBER DIE MOEGLICHKEIT DER THERMISCHEN BEEINFLUSSUNG DES FLIESSVERHALTENS VON KUNSTSTOFFEN DURCH ULTRASCHALL SCHLUSSBERICHT]
R. Pohlman 31 May 1974 63 p refs In GERMAN
(Contract AIF-2635)
Avail: NTIS HC $4.25

Plastification tests using axially and radially incident ultrasonic radiation were performed on low density polyethylene (PE) and styrene-acrylonitride-copolymer (SAN) to improve extrusion properties. Thermoelement temperature measurements were carried out within the materials at defined distances from the ultrasonic transducers. Tests were conducted at frequencies of 15 and 10 kHz. PE plastification initiates at the transducer and propagates axially as a function of time. In SAN, characteristic temperature maxima were observed which are attributed to the effect of standing waves. ESRO

N75-16675# Technische Hochschule, Aachen (West Germany). Lab. fuer Ultraschall.
DEVELOPMENT OF AN ULTRASONIC METHOD FOR MEASURING THE VISCOSITY OF PLASTIC MELTS IN EXTRUDERS FOR THE CONTROL OF EXTRUDER STRANDS Final Report [ENTWICKLUNG EINES ULTRASCHALL-MESSVERFAHRENS ZUR VISKOSITAETSMESSUNG VON KUNSTSTOFFSCHMELZEN IN EXTRUDERN ZUR STEUERUNG VON EXTRUDERSTRASSEN SCHLUSSBERICHT]
R. Pohlman 14 Dec. 1973 45 p refs In GERMAN
(Contract AIF-2380)
Avail: NTIS HC $3.75

Ultrasonic and viscosity measurements were carried out in a high density polyethylene melt. The ultrasonic measurements are related to the average temperature in the melt volume penetrated by sound pulses. Sound velocity and absorption measurements were performed in the temperature range 160 to 260 C at pressures of 1 and 2 kp/sq cm. It is concluded that delay of sound pulses be used as main control parameter for control of extruders. ESRO

N75-16676# Institut fuer Festkoerpermechanik, Freiburg (West Germany).
PROJECTILE IMPACT ON GLASS AND POLYMERIC OPHTALMIC LENSES AND CIRCULAR PLATES
W. Goldsmith (Calif. Univ., Berkeley) and W. Weigel May 1974 74 p refs
(IFKM-WB-2/74) Avail: NTIS HC $4.25

Ballistic limits and fracture behavior of six plane opthalmic lenses composed of glass, CR-39 and polycarbonate and of two types of disks composed of glass and CR-39, respectively, were determined. Cinematographic, shadow-optic, and birefringent techniques were applied, using a 24-spark Cranz-Schardin camera. Projectiles consisting of 4.5 mm lead sphere coated with copper and a 4.5 mm slug with a conical nose were propelled against the specimens with initial velocities ranging from 38 to 185 m/sec. A ballistic limit of about 100 m/sec was established for the CR-39 lenses and of about 50 m/sec for all but one of the glass specimens and for the CR-39 flat plate. ESRO

N75-16677# Army Foreign Science and Technology Center, Charlottesville, Va.
GLUING TECHNOLOGY
L. M. Kovalchuk 15 Apr. 1974 295 p refs Transl. into ENGLISH from the monograph "Tekhnologiya Skleivanie Lesnaya Promyshlennost" Moscow, 206 p
(AD-785963; FSTC-HT-23-0292-74) Avail: NTIS CSCL 11/1

Various types of glues, methods of gluing wood materials with them, and basic technological operations of the gluing process are considered along with changes in glue properties in the process of their preparation and application. Procedures for preparation and application of glues, the rate of hardening of glues depending on their composition, viscosity, heating temperatures, and procedures for gluing wood to wood, glass, plastic, and other materials are presented. Factors which affect the strength of joints, the causes and nature of the formation of stresses in glued joints, the relationship of strength and longevity of glued joints to gluing methods and procedures are discussed.
GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-16678# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
SYNTHESIS OF A NEW POLYMER: POLYMETHALLYL NITRATE (PMAN) [SYNTHESE EINES NEUEN POLYMEREN: POLYMETHALLYLNITRAT (PMAN)]
K. M. Bucerius 31 Dec. 1973 16 p refs In GERMAN
(ICT-7/73) Avail: NTIS HC $3.25

Polymethallyl nitrate (PMAN), a new explosive polymer devoid of autocatalytic effects, was synthesized by nitrating polymethallyl alcohol obtained by reducing polymethacrylate methyle ester with lithium aluminum hydride. Elementary analysis and infrared spectra met theoretical predictions. PMAN was stabilized by washing in water. Weight loss tests compared favorably with polyvinylnitrate and polyallyl nitrate. ESRO

N75-16679# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
CASTABLE GAS GENERATOR PROPELLANTS WITH LOW FLAME TEMPERATURES [GIESSBARE GASGENERATORTREIBSTOFFE MIT NIEDEREN FLAMMENTEMPERATUREN]
W. Kloehn 31 Dec. 1973 17 p refs In GERMAN
(ICT-14/73) Avail: NTIS HC $3.25

Thermodynamic properties, burning rate, combustion efficiency, viscoelasticity, and chemical stability are discussed for composite, castable propellants adequate for inflight servosystem gas generator engines. The propellants discussed comprised nitrocellulose fluid balls, nitroglycerin, diethyleneglycol dinitrate, polyurethane binder, and nitroguianidine. ESRO

N75-16680# Rocket Propulsion Establishment, Westcott (England).
THE SIGNIFICANCE OF EMISSION FROM EXCITED FORMALDEHYDE IN PREMIXED FLAMES OF SOME HYDROCARBONS AND PERCHLORIC ACID
A. R. Hall Dec. 1973 19 p refs
(RPE-TN-245; BR41164) Avail: NTIS HC $3.25

The cool flame emission from excited formaldehyde in

premixed flames of 72% perchloric acid and methane, or a fuel which produces methane in the flame, is attributed to a reaction between the CH3 radical and ClO3, ClO2, or ClO. The yield of light quanta emitted by excited formaldehyde per molecule of methane consumed was measured. Although this reaction does not constitute a step in the main mechanism of the combustion, the emission could, in principle, be used to indicate the proportion of fuel in a composite propellant based on ammonium perchlorate and polyisobutene which reacts with chlorine-oxygen compounds. Author (ESRO)

N75-16681# Arbeitsgruppe fuer Ballistische Forschung, Weil am Rhein (West Germany).
AFTERBURNING PHENOMENA IN THE MUZZLE FIRE OF RIFLES [NACHVERBRENNUNGSERSCHEINUNGEN IM MUENDUNGSLEUCHTEN EINES INFANTERIEGEWEHRES]
G. Klingenberg Dec. 1973 86 p refs In GERMAN
(ABF-3/73) Avail: NTIS HC $4.75

For rifle shooting in air, inert gases and oxygen, afterburning effects in muzzle fires were investigated. The after reactions of unburnt propellant gases occurring in the muzzle region of a rifle could be explained by comparison with measurements in a powder rocket jet. From temperature distribution and black temperature measurements of the continuum radiation during firing in oxygen atmosphere a gas temperature of 2900 + or - 15% K at 40 cm before the muzzle was established. ESRO

N75-16682# Physics International Co., San Leandro, Calif.
DEVELOPMENT OF A LOW-DENSITY AMMONIUM NITRATE/FUEL OIL EXPLOSIVE AND MODELING OF ITS DETONATION PROPERTIES Final Report, 25 Oct. 1971 - 30 Dec. 1972
M. W. McKay, S. L. Hancock, and D. Randall Oct. 1974 59 p refs
(Contract DNA001-72-C-0052)
(AD-787617; PIFR-383-Vol-2; DNA-3351F) Avail: NTIS CSCL 19/4

A low-density ammonium nitrate/fuel oil (ANFO) explosive was developed by diluting the normal density explosive with low-density polystyrene beads. Stable detonations were achieved in mixtures having densities over the range 0.5 to 0.9 gm/cc. The detonation velocity was found to decrease approximately linearly with decreasing density. The explosive was found to have a long reaction time and required large charges with propagation distances on the order of 100 to 150 cm to establish a steady-state detonation. The buildup of the detonation wave to its steady-state velocity was successfully modeled using a grain-burning reaction rate theory with a reaction time constant of 100 microsec. A mixture having a density of 0.75 gm/cc was selected as the explosive for the MINE THROW II Event and a mathematical model of its detonation properties was developed for use in the charge design calculations.
Author (GRA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-16683 British Library Lending Div., Boston Spa (England).
THE SIMULTANEOUS REDUCTION OF NICKEL OXIDE-COBALT OXIDE MIXTURES
D. I. Ryzhonkov, V. V. Sazonov, and V. A. Kolchanov 1973 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 7, 1974 p 5-8
(BLL-M-25034-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The experimental results of the simultaneous reduction of NiO-CoO mixtures with solid carbon in nonisothermic conditions are presented. It is shown that the rate and amount of reduction of these mixtures are functions of the temperature and composition of the mixture. The formation of solid solutions or intermediate compounds between the initial oxides and between the reduced metals evidently has a decisive effect on the reduction process.
Author

N75-16684# Atomic Energy Research Establishment, Harwell (England). Engineering Div.
TEST TO DESTRUCTION OF LIQUID NITROGEN DEWARS
F. W. Yeats and L. R. Cohen May 1974 27 p refs
(AERE-R-7744) Avail: AEC Depository Libraries HC $4.50

A detailed account of a series of experiments that tested a number of 75-liter capacity copper-constructed liquid nitrogen dewars to destruction is given. The dewars were destroyed by pressure explosions or by pressure implosion and a comparison was made of the debris derived. The pressures at bursting point were noted and compared. Experiments were carried out to determine the normal boil off rate from a dewar and to find the boil off rate on a dewar with the vacuum insulation destroyed.
Author (NSA)

N75-16685# Los Alamos Scientific Lab., N.Mex.
COMPUTERIZED INVENTORY/DESIGN SYSTEM FOR GRAPHITE MOLDS
W. C. Erickson and S. E. Newfield 1974 13 p Presented at the CUBE Symp., Livermore, Calif., 23-25 Oct. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1523; Conf-741001-10) Avail: NTIS HC $3.25

A computer code was developed to both inventory and design graphite foundry molds. The stock of existing mold cases (exterior wall of mold) is examined in search of a size that can be used for the current casting requirement. Successful candidates are further screened, until one candidate is selected. If none is found in inventory, a new case is designed. A core (interior wall of mold) is designed in every instance, since it is destroyed during removal of the casting. Computer-generated drawings for case, core, and assembly are produced on an x-y plotter.
Author (NSA)

N75-16686# Oak Ridge National Lab., Tenn.
ORRMIS: OAK RIDGE REGIONAL MODELING INFORMATION SYSTEM, PART 1
R. C. Durfee Sep. 1974 112 p refs
(Contract W-7405-eng-26)
(ORNL-NSF-EP-73-Pt-1) Avail: NTIS HC $5.25

A geographically oriented information system is being developed by the Regional Environmental Systems Analysis Program at Oak Ridge National Laboratory (ORNL). The system is being designed to operate either as a stand-alone inquiry-retrieval system or as a communications supervisor for use with simulation models. The primary purpose of ORRMIS is to provide the data management capability for analysis models which forecast the spatial distribution and ecological effects of activities within a geographical region. The geographic orientation of the system may, however, be replaced with a more general adjacency relationship thereby extending its use to non-geographic models.
Author (NSA)

N75-16687# Oak Ridge National Lab., Tenn.
CRYOGENIC POWER TRANSMISSION TECHNOLOGY: CRYOGENIC DIELECTRICS Quarterly Report, 1 Jan. - 31 Mar. 1974
31 Mar. 1974 32 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4622) Avail: NTIS HC $3.75

Several modifications were made to the intermediate voltage equipment to improve performance and quality of the data. The modifications included improved electrode gap stability, electrode surface conditions and exterior flashover performance, a switch to change the polarity of the electrodes, the fitting of probability distribution functions to the breakdown data, work on the high voltage cryostat, and ac breakdown tests with the intermediate voltage cryostat. To verify that modification of the intermediate voltage cryostat had no deleterious effect on the measured breakdown voltages in liquid helium, an additional set of measurements was made with the spherical high voltage electrode positive. The average breakdown voltages agreed well within scatter with the previous ones, but were systematically somewhat higher. Another set of measurements made with opposite polarity also agreed well. At several gaps with both polarities, 120 breakdowns were taken for statistical analysis. Probability plotting techniques were used to determine the type of distribution function which gave the best fit to the data. Author (NSA)

N75-16688# Explosives Research and Development Establishment, Waltham Abbey (England).
CRYOGENIC TRANSFER HOSES: HEAT LEAK TESTS
I. G. Costen and J. A. Lewis Jan. 1974 13 p
(ERDE-TN-99; BR42278) Avail: NTIS HC $3.25

The steady state heat leak into six commercially produced cryogenic transfer hoses was determined by filling the hoses with liquid nitrogen and measuring the volumetric rate of flow of nitrogen gas evolved from the hoses. All hoses performed better than specification at approximately 60% of the target figure. The smaller diameter light-weight hoses showed slightly poorer results than the rest of the hoses but were much easier to handle. Author (ESRO)

N75-16689# Operations Research, Inc., Silver Spring, Md.
A GUIDE TO ASSESS THE OPERATIONAL IMPLICATIONS OF NEW SHIP DESIGN CONCEPTS, PART 3 Final Report
Ernest L. Holmode 28 Feb. 1974 51 p refs
(Contract N00014-70-C-0426; NR Proj. 274-121)
(AD-787664; ORI-TR-829-Pt-3) Avail: NTIS CSCL 13/10

This report covers concluding work performed for the Office of Naval Research, Naval Analysis Programs, under Contract N00014-70-C-0426. Two previous reports have been published under the same title: Part I, ORI TR 667, 11 June 1967, AD 728003; Part II, ORI TR 741, 22 March 1973, AD 759376. Part 3 provides basic guidance and understanding to the planning analyst in the area of inherent operational advantages and limitations of the three major high-performance ship concepts under development today: (1) Small-Waterplane-Area Twin-Hull (SWATH); (2) submerged-foil hydrofoil; and (3) Air Cushion Supported Vehicles (ACV and SES). Many other concepts are briefly introduced. Concept descriptions, basic trade-offs, basic operational qualities, size range limitations and operational implications/potential applications are included. Discussion tends to be subjective and is designed to alert the analyst to potential problem areas rather than provide quantitative assessment of the concepts. Author (GRA)

N75-16690# Naval Ship Research and Development Center, Bethesda, Md.
MODEL RESISTANCE DATA OF SERIES 65 HULL FORMS APPLICABLE TO HYDROFOILS AND PLANING CRAFT
Henry D. Holling and E. Nadine Hubble May 1974 434 p
(AD-784980; NSRDC-4121) Avail: NTIS CSCL 13/10

Captive model resistance data are presented for a series of hull forms developed from existing AGEH lines as part of a hydrofoil craft research program. These hulls are also applicable to planing craft. Variations in length-to-beam, length-to-draft, and beam-to-draft ratios are represented for each of two basic configurations, one suitable for airplane-type hydrofoil support systems and the other for canard type. Resistance, trimming moment, effective longitudinal center of gravity, draft, wetted area, and wetted lengths are presented for various trim angles, loadings, and speeds in the hullborne and takeoff regimes.
Author

N75-16691# Oak Ridge National Lab., Tenn.
DIELECTRIC STRENGTH OF LIQUID HELIUM IN MILLIMETER GAPS
S. W. Schwenterly, W. F. Gauster, R. H. Kernohan, H. M. Long, and M. M. Menon 1974 13 p refs Presented at the Conf. on Elec. Insulation and Dielec. Phenomena, Downington, Pa. Sponsored by AEC
(Conf-741008-3) Avail: NTIS HC $3.25

A program underway at Oak Ridge National Laboratory to investigate the high voltage electrical properties of fluids and solids for cryogenic systems is described. As the first result of these investigations, measurements of the breakdown strength of liquid helium boiling at atmospheric pressure, under voltages up to + or - 130 kV dc and in gaps of up to 2.5 mm, are reported. Preliminary results with ac voltage were also obtained.
NSA

N75-17202* Grice Ocean Engineering, Inc., Houston, Tex.
LOCATING UNDERWATER OBJECTS
C. Fitzhugh Grice *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 143-152 (For availability see N75-17188 08-80)
CSCL 14B

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N75-16692 British Broadcasting Corp., Kingswood (England). Research Dept.
DIGITAL VIDEO: NUMBER OF BITS PER SAMPLE REQUIRED FOR REFERENCE CODING OF LUMINANCE AND COLOUR-DIFFERENCE SIGNALS
T. A. Moore Dec. 1974 12 p refs
(BBC-RD-1974/42) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England CSCL 17B

The basic parameters are investigated of a reference pulse code modulation system intended as a standard of comparison for any digital system designed to transmit high-quality color television signals. The number of bits per sample required for each of the three component signals Y, U and V was estimated using two different theoretical approaches. First, the quantizing accuracy was made to correspond to the random noise allowable on a hypothetical reference analog circuit. Second, the quantizing accuracy required was determined by referring to known just noticeable differences in the luminance and chromaticity of the display. Subjective tests were also carried out using both critical test signals and signals from a slide scanner representative of typical pictures. The various results are compared and it is concluded that for normal high-grade picture sources seven bits per sample are required for each of the three component signals. Author

N75-16693 British Library Lending Div., Boston Spa (England).
THE OPTIMIZATION OF THE SAMPLING POINT OF THE ADAPTIVE TRANSVERSAL FILTER EQUALIZER
H. Selim Nov. 1974 16 p refs Transl. into ENGLISH from Nachrichtentech. Z. (West Ger.), v. 27, no. 6, 1974 p 225-229
(BLL-Trans-3174-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A numerical analysis of the characteristics of an adaptive transversal filter equalizer is presented. The optimization of the sampling point of the system is discussed. The construction of the system from a transmission channel and a sampler is explained and the periodic transmission function due to sampling is analyzed. Author

N75-16694 British Library Lending Div., Boston Spa (England).
FREQUENCY MEASUREMENT BY SIGNAL SCANNING
Karl-Heinzi Jutzi 30 May 1974 9 p refs Transl. into ENGLISH from Frequenz (Berlin), v. 27, no. 11, 1973 p 309-311
(BLL-Trans-3120-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The measurement of very low frequencies usually requires a long measurement time to reach high accuracy. A method is described using samples of a sinusoidal time function to determine its interesting parameters in a very short time. This method can also be applied to the envelope of basic functions. The quality of this measurement method depends on the sampling process.
Author

N75-16695# Japan Broadcasting Corp., Tokyo.
PREDICTION METHOD FOR NIGHT-TIME MF SKY-WAVE FIELD STRENGTH, EVALUATION OF MEDIAN FIELD STRENGTHS
Akira Kinase and Shiro Itoh Apr. 1974 28 p refs
(NHK-Labs-Note-177) Avail: NTIS HC $3.75

This paper recapitulates the results of the work termed Phase 1 in this attempt, namely the method for predicting median field strengths as an initial standard of reference by the use of a plausible modelling of the media through and/or via which radio waves travel. This method has been derived from a union of electromagnetic and magneto-ionic theories and is mainly based

on the simple ray-theoretical approach. The contents are mainly concerned with the propagation via the E-layer, and related typical examples are presented properly in a tabular or graphical form.
Author

N75-16696*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK Progress Report, Nov. - Dec. 1974
15 Feb. 1975 198 p refs
(Contract NAS7-100)
(NASA-CR-142112; JPL-PR-42-25) Avail: NTIS HC $7.00 CSCL 17B

The objectives, functions, and organization of the Deep Space Network are summarized. Deep space station, ground communication, and network operations control capabilities are described.
Author

N75-16697# National Aviation Facilities Experimental Center, Atlantic City, N.J.
INVESTIGATION ON RADIOFREQUENCY INTERFERENCE TO THE BACKUP EMERGENCY COMMUNICATION EQUIPMENT AT THE ELWOOD, NEW JERSEY, LONG-RANGE RADAR SITE Final Report, Mar. 1973 - Jan. 1974
George Apostolakis and Arthur Moss Jul. 1974 37 p
(FAA Proj. 121-101-110)
(AD-783633; FAA-RD-74-115; FAA-NA-74-13) Avail: NTIS HC $3.25

Backup emergency communication (BUEC) equipment in the field was reported impaired by radiofrequency interference (RFI). An investigation by the National Aviation Facilities Experimental Center at the long-range radar site located at Elwood, New Jersey showed that the two major sources of RFI were the common digitizer (CD) (with its doors open) and the radar. The RFI from the radar was concentrated into solid, broad-frequency bands 1 to 4 megahertz (MHz) wide, and was evident on the ground level only. The RFI from the CD occurred at discrete frequencies, and was evident on the equipment building roof and radar tower catwalk, as well as on the ground level. Consistently strong RFI was noted at seven very high frequencies (VHF), ranging from 121.575 and 134.5 MHz, and at 11 ultrahigh frequencies (UHF) ranging from 299.40 to 305.55 MHz. RFI at UHF frequencies on the catwalk rail is eliminated by suspending a 6X6-foot copper mesh screen on the catwalk deck underneath and outward from the BUEC antenna. Moving the BUEC antenna radially inward from the protective rail and mounting it above the catwalk deck provides effective shielding at both VHF and UHF.
Author

N75-16698# National Weather Service, Washington, D.C. Equipment Development Lab.
REMOTE MONITORING OF VISIBILITY IN MOUNTAIN PASSES Final Report, Mar. 1972 - Apr. 1974
Joseph Czika and Kenneth H. Shreeve Apr. 1974 61 p
(Contract DOT-FA72WAI-244)
(AD-781796; FAA-RD-74-53) Avail: NTIS HC $3.25

This report describes the work accomplished and results obtained during an experimental program that evaluated television and slow-scan video transmission techniques as a means to remotely monitor visibility in mountain passes. The purpose of the program was to demonstrate the practicality of this technique to provide VFR pilot advisories in remote mountain passes. Experimental television equipment was installed at Stampede Pass and Boeing Field, Washington, interconnected to transmit pictures via slow-scan techniques over telephone lines from Stampede Pass.
Author

N75-16699# Japan Broadcasting Corp., Tokyo. Broadcasting Science Research Labs.
PRECISION POLYGONAL MIRROR FOR HIGH QUALITY LASER COLOR TELEVISION DISPLAY
Yukio Kameyama, Hitoshi Masuko, Shihei Kutsuzawa, Minoru Naraoka, and Tameoki Shirai Aug. 1974 13 p refs
(NHK-Labs-Note-179) Avail: NTIS HC $3.25

The experimental manufacture of a precision metallic polygonal mirror is described for use as a horizontal deflector for a high quality laser display. The mirror design, and manufacturing methods are discussed.
F.O.S.

N75-16700*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
SHUTTLE EXTRAVEHICULAR ACTIVITY SIGNAL PROCESSOR PULSE AMPLITUDE MODULATION DECOMMUTATOR
D. E. Noble and W. M. Conrad Dec. 1974 67 p Revised Supersedes LEC-3649
(Contract NAS9-12200)
(NASA-CR-141611; JSC-09285-Rev-A; LEC-3649) Avail: NTIS HC $4.25 CSCL 17B

To provide data with long-term stability and accuracy, the pulse amplitude modulation (PAM) decommutator was synchronized to the PAM-return to zero wavetrain, and each channel was sampled with a common sample and hold circuit and digitized sequentially. The digital value of each channel was then scaled by the digital value of the calibration channels. The corrected digital value of each channel was stored for one complete frame and then transferred to the multiplexer-demultiplexer at a high rate in one block of serial digital data. A test model was built to demonstrate this design approach taken for the PAM decom and performance data was provided. The accuracies obtained with various signal to noise ratios are shown.
Author

N75-16701# Australian Post Office Research Labs., Melbourne.
COLOUR T. V. TRANSMISSION OVER SINGLE QUAD CABLE-TRANSMISSION LIMITS IMPOSED BY CROSSTALK
A. J. Gibbs Jul. 1974 7 p refs
(Rept-6907) Avail: NTIS HC $3.25

A single-quad cable is described which allows the transmission of baseband color TV signals in the same cable, either in a full-duplex configuration or in a double-simplex configuration. It was found that the total length over which such configurations can be employed is limited by crosstalk, thermal noise, and equalizer accuracy. The limits imposed by crosstalk were determined, and these indicate that full-duplex operation is limited by near-end crosstalk while double-simplex operation is limited by thermal noise and/or equalizer accuracy.
Author

N75-16702# Sandia Labs., Albuquerque, N.Mex.
PMRRAD: A COMPUTER PROGRAM TO CONVERT PACIFIC MISSILE RANGE RADAR TRACKING DATA TO TRAJECTORY POSITION DATA
F. E. Forsythe and R. J. Orzel Oct. 1974 57 p refs
(Contract AT(29-1)-789)
(SLA-74-0263) Avail: NTIS HC $4.25

The PMRRAD computer program reduces radar tracking data, generated by the Pacific missile range tracking stations at the Kauai Test Range, to trajectory data. The report describes the program, the mathematics involved, and the several computing and output options available to the user.
Author (NSA)

N75-16703# Signals Research and Development Establishment, Christchurch (England).
A SPHERICAL REFLECTOR ANTENNA FOR COMMUNICATION SATELLITE EARTH STATIONS
P. H. Masterman Dec. 1972 98 p refs
(SRDE-72031; BR41806) Avail: NTIS HC $4.75

An experimental spherical-reflector microwave antenna is described. It has a movable broad-band feed incorporating a concave subreflector, which permits + or - 7 deg beam-steering without loss of gain. Overall efficiency was measured as 50%, but this could be raised to 58% by eliminating reflector distortion. The first sidelobe level was -10 6db and antenna noise temperature was 30 K. Possible improvements include raising efficiency by allowing some gain variation on scanning. Optimum design then depends on system noise temperature and scanning requirements, but it is concluded that up to 75% on-axis efficiency is obtainable. Loss in gain at 7 deg scan is typically 0.3db.
Author (ESRO)

N75-16704# Signals Research and Development Establishment, Christchurch (England).
A 4800 BITS/SEC ADAPTIVE PCM SPEECH CODER
R. M. Wilkinson Sep. 1973 26 p refs
(SRDE-73031; BR41301) Avail: NTIS HC $3.75

A speech coder which enables telephone speech signals to be transmitted over a 4800 bits/sec digital channel is described.

The principle is that of a pulse code modulator which uses only one bit to code each sample. This bit represents the polarity of the sample. In addition, information is transmitted about the amplitude of the speech signal envelope. The speech quality achieved is low but provides a usable communication channel. The system may be useful in situations where low bit rate digital transmission is necessary using simple coding equipment.
Author (ESRO)

N75-16705# European Space Research Organization, Paris (France).
PROSPECTS OF THE USE OF SATELLITES FOR BROADCAST AND EDUCATION
C. Rosetti 1974 32 p Presented at the UN Panel Meeting on Satellite Broadcasting Systems for Educ., Tokyo, 1974
Avail: NTIS HC $3.75

The problems raised by the adoption of a satellite broadcasting system, include: (1) compatibility with existing systems, (2) efficient use of the frequency spectrum and geostationary orbit, (3) definition of the service area, and (4) choice of the most economical system for receiving the programs. The ground segment of the satellite system is analyzed and the characteristics which the satellite must possess, such as reliability and signal quality, are reviewed. The costs of the space segment are considered and the economic prospects discussed. ESRO

N75-16706# AEG-Telefunken, Backnang (West Germany).
PROJECT IME-D DAUGHTER SATELLITE. COMPLEMENTARY STUDY OF S-BAND TRANSPONDER
H.-G. Batz 1974 117 p refs
(Contract ESTEC-2113/73-PP)
(ESRO-CR(P)-557) Avail: NTIS HC $5.25

Preliminary investigations was carried out for a coherent S-band transponder compatible with the NASA unified S-band system (USB) for the International Magnetospheric Explorer daughter satellite. Compatibility between the chosen receiver and transmitter, was demonstrated by building and testing the interface circuitry. The problem of increasing the loop bandwidth of the receiver which was originally designed for compatibility with the deep space ground network is investigated. Work carried out is described, the results of tests at ambient temperature and at -20 C are given, and problem areas highlighted. ESRO

N75-16707# Steria Automatisme et Ingenierie, Paris (France).
DEVELOPMENT OF A COMPUTER PROGRAMME FOR THE EVALUATION OF THE FREQUENCY PLANS OF THE SATELLITE BROADCASTING SERVICE AND OF THE TERRESTRIAL SERVICES USING THE 11.7 - 12.5 GHz FREQUENCY BAND
Sep. 1974 88 p
(Contract ESRO-SC/14/73-HQ)
(ESRO-CR(P)-561) Avail: NTIS HC $4.75

A computer program is developed, devised to evaluate the performance of a plane for frequencies and positions in orbit, and subsequently its optimization of technical, economic, and mission constraints. The program is built in modular form, making use of subprograms which can be employed independently. Algorithms may be added, enabling frequency plans to be generated automatically on the basis of a given criterion and iteratively used. Algorithms are given for standardization of antennas and of powers, for computation of link budgets and also plots of coordination contours for interference caused by broadcasting satellites to earth service receivers are exemplified. ESRO

N75-16708# European Space Research Organization, Paris (France).
PROSPECTS OF THE USE OF SATELLITES FOR BROADCAST AND EDUCATION
C. Rosetti 1974 32 p Presented at the UN Panel Meeting on Satellite Broadcasting Systems for Education, Tokyo, 1974
Avail: NTIS HC $3.75

Problems raised by the adoption of a satellite television broadcasting system are reviewed. Problems covered include system compatibility with other existing systems, efficient use of the frequency spectrum and the geostationary orbit, definition of the service area, and choice of the most economical system for receiving the programs. Economical and technical aspects of satellite TV broadcasting are discussed with respect for results of an ESRO system simulation with a computer program developed for the purpose. ESRO

N75-16709# Eye and Ear Hospital, Pittsburgh, Pa.
CONSONANT CONFUSIONS IN NOISE: A STUDY OF PERCEPTUAL FEATURES
Marilyn D. Wang and Robert C. Bilger 1974 70 p refs Prepared in cooperation with Pittsburgh Univ., Pa.
(Grant SRS-14-P-55126/3)
(PB-236864/5) Avail: NTIS HC $4.25 CSCL 05G

Consonant confusion matrices were obtained for four sets of consonant vowel and vowel consonant nonsense syllables presented both in quiet and in the presence of a masking noise. A sequential method of partitioning transmitted information for confusion matrices was developed. It was used to test the hypothesis that certain articulatory and phonological features of consonants consistently account for transmitted information better than other, closely related, features. (Modified author abstract) GRA

N75-16710# Joint Tactical Communications Office, Fort Monmouth, N.J.
COST EFFECTIVENESS PROGRAM PLAN FOR JOINT TACTICAL COMMUNICATIONS. VOLUME 3: LIFE CYCLE COSTING Final Report
Thomas J. Bellanca Aug. 1974 135 p refs
(AD-787533; TTO-ORT-032-74-Vol-3) Avail: NTIS CSCL 17/2

The purpose of Volume 3 is to provide the necessary guidelines and methodology for the preparation of Life Cycle Costs that are used in cost effectiveness analysis of tactical communication programs and in the optimization of communication system/equipment design. The Life Cycle Costing Volume contains the following information: The Basic structure of the LCC model; definitions of all the cost elements involved in the acquisition and ownership of communication equipment; general and specific TRI-TAC recommendations concerning certain ground rules and assumptions to be used in LCC analysis of TRI-TAC related programs; equations with appropriate cost factors to calculate operating and support costs; formats for the presentation of the cost data. In addition, general guidelines and information are presented on the treatment of learning curves, discounting and inflation in LCC analysis. (Modified author abstract) GRA

N75-16906* Scientific Translation Service, Santa Barbara, Calif.
THE ROLE OF LARGE PARTICLES IN THE FORMATION OF THE RADIO ECHO
Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 7-13 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 8-13 (For availability see N75-16904 08-42)
CSCL 17I

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-16711 British Library Lending Div., Boston Spa (England).
RESEARCH ON RELIABILITY OF CABLES SUBJECTED TO VOLTAGE GRADIENT STRESSES
Feb. 1974 17 p refs Transl. into ENGLISH from Rev. Gen. Elec. (Paris), v. 81, no. 11, Nov. 1971 p 831-836
(BLL-CE-Trans-6335-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The elements which influence the reliability of cables exposed to voltage gradient stresses are studied. Reliability for a typical cable is determined by synthesis of these elements. The method requires an extensive mathematical study of the laws of exponential dispersion. Author

N75-16712 British Library Lending Div., Boston Spa (England).
STATE OF THE ART AND PROSPECTS FOR ELECTRIC VEHICLES
K.-J. Oehms 29 Oct. 1973 19 p Transl. into ENGLISH from Elektrizitaetswirtschaft (West Ger.), v. 70, no. 17, 16 Aug. 1971 p 511-517
(BLL-OA-Trans-1250-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The electrical components for electric vehicles for use in city centres, viz. dc motors, thyristor controllers, lead-acid accumulators and battery changing techniques have been investigated in experimental vehicles. Their investigation can soon be concluded, and the series construction of vehicles which meet the appropriate marketing requirements commenced. Electric vehicles will help to solve particularly severe environmental problems. Thus, only a few years are needed for their large scale introduction into traffic, and then the statement that a true breakthrough in electric vehicles has already begun, is confirmed. Author

N75-16713 British Library Lending Div., Boston Spa (England).
FUTURE PROSPECTS FOR POWER TRANSMISSION BY OVERHEAD LINES AND CABLES
E. Abilgaard 4 Feb. 1974 22 p refs Transl. into ENGLISH from Energietechnik (Leipzig), v. 25, no. 4, 1973 p 101-110
(BLL-CE-Trans-6274-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Electric power transmission through overhead lines and buried cables was investigated. The characteristics of overhead lines discussed include transmission capacity, surface voltage gradient of the conductors, system voltage, absorption or generation of high reactive power, and stability. Various types of cables were investigated, including cables with artificial cooling, SF6 cables, cryocables, and superconducting cables. High voltage dc transmission, three-phase transmission, half-wave transmission, and microwave transmission are also discussed. M.J.S.

N75-16714 British Library Lending Div., Boston Spa (England).
FURTHER RESEARCH INTO THE DIFFERENTIAL CHARGE PUMPING EFFECT IN MOS-TRANSISTORS
J. Golder 4 Feb. 1974 19 p refs Transl. into ENGLISH from Helv. Phys. Acta (Basel), v. 44, no. 7, 1971 p 866-883
(BLL-Trans-3041-(9022.81)) Avail: NTIS Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The behavior of a metal oxide semiconductor-transistor under small variations of the gate potential about an equilibrium value is described. The change in the charge carrier concentrations in the bands as well as in the interface states in the forbidden zone is discussed in terms of an equivalent scheme, the elements of which depend solely on the equilibrium quantities. It was found that the finite averaged substrate current is about 103 to 104 times smaller than the amplitude of the alternating current described by linear relations. This effect is termed 'charge pumping'. The effect of diffusion of electrons from the bulk substrate to the surface and of holes through the weak inversion layer is also taken into account. It is shown that the effect of the diffusion is negligibly small for elements with low state densities at the interface. M.J.S.

N75-16715 British Library Lending Div., Boston Spa (England).
NARROW BAND FILTERS
P. Amstutz 4 Feb. 1974 15 p refs Transl. into ENGLISH from Cables Transmission (Paris), v. 21, no. 2, Apr. 1967 p 88-97
(BLL-Trans-2991-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Filters whose characteristics do not vary to a large extent except in a narrow frequency band are theoretically studied. Approximation formulas are substituted for the usual methods in order to simplify calculations and suggest new possibilities. Examples are given. Author

N75-16716 Polish Academy of Sciences, Warsaw.
DETERMINATION OF INDUCED POLES IN A CONCENTRIC SYSTEM [WYZNACZANIE POL INDUKOWANYCH W STRATNYM UKLADZIE KONCENTRYCZNYM]
B. Jaskorzynska-Dzieciaszek 3 Apr. 1973 18 p refs In POLISH
(Rept-9/1973) Avail: Issuing Activity

General situations are presented in which the conductivity of an internal cylinder is finite. A loop with a magnetic current concentrically placed in proportion to both cylinders was used for the investigation. Other topics discussed include Fourier transformations, Bessel functions, Hankel functions, Riemann waves, waveguides, and wave propagation. Transl. by M.J.S.

N75-16717 Polish Academy of Sciences, Warsaw.
DIRECTIONAL FUNCTIONS OF ELECTRICAL SOURCES RADIATING OVER A PLANE WITH GRINBERG-FOK CONDITIONS [O FUNKCJACH KIERUNKOWYCH ZRODEL ELEKTRYCZNYCH PROMIENIUJACYCH AND PLASCZYZNA Z WARUNKAMI GRINBERGA-FOKA]
Lucjan A. Wegrowicz 3 Apr. 1973 17 p In POLISH
(Rept-10/1973) Avail: Issuing Activity

An algorithm is constructed for finding directional functions of electrical sources radiating over nonideally conductive, plane surface boundaries with Grinberg-Fok conditions. Other topics discussed include integral functions, monochromatic radiation, Helmholtz equations, Green functions, Bessel functions, and matrix equations. Transl. by M.J.S.

N75-16718 British Library Lending Div., Boston Spa (England).
WORK FUNCTION DIFFERENCES AND CHARGE DENSITIES OF MIS STRUCTURES WITH Si3N4 AND SiO2-Si3N4 INSULATORS
R. Hezel 15 May 1974 11 p refs Transl. into ENGLISH from Siemens Forsch. Entwicklungsber. (Berlin), v. 1, no. 1, 1972 p 153-156
(BLL-Trans-3008-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The operating voltage of MIS transistors is lowered by using silicon nitride in combination with thermal silicon oxide as the gate insulator. Silicon nitride is used as a gate insulator in the MNOS storage transistors. The dependence of the flat band voltages on layer thickness in MNS and MNOS structures is examined to determine the interfacial charge densities and the contact potential difference between the gate metal and the semiconductor. The operating voltage is then determined from these quantities. Author

N75-16719*# ITT Cannon Electric, Inc., Santa Ana, Calif.
MODIFIED ELECTRICAL CONNECTOR Final Report
Stephen Yamamoto Dec. 1974 23 p
(Contract NAS9-13955)
(NASA-CR-141575) Avail: NTIS HC $3.25 CSCL 09A

A removable interfacial insulator design concept is described that simplifies electrical connector repairability when damage occurs to male electrical contacts or resilient interfacial seal. Author

N75-16720# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
FAA/GEORGIA INSTITUTE OF TECHNOLOGY WORKSHOP ON THE GROUNDING OF ELECTRONIC SYSTEMS
Mar. 1974 245 p refs Workshop held at Atlanta, 12-14 Mar. 1974
(Contract DOT-FA72WA-2850)
(AD-785858; FAA-RD-74-147) Avail: NTIS HC $7.50

The proceedings of a workshop on the subject of the grounding of electronic systems are presented. Some of the subjects considered are as follows: (1) signal grounding concepts, (2) applied grounding practices, (3) large system grounding, (4) protection of computers, (5) signal grounding technique for air route traffic control centers, (6) grounding of lightning surges in land based communication facilities, and (7) signal common and electrical grounding. For individual titles, see N75-16721 through N75-16735.

N75-16721 Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
SIGNAL GROUNDING CONCEPTS
Jimmy A. Woody *In its* FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 1-10
(For availability see N75-16720 08-33)

The techniques for signal grounding to establish an equipotential reference plane to prevent interference and to dispose of

unwanted excess energy are discussed. The four objectives of the signal grounding process are defined. The ground network configurations are identified as floating ground, the single-point ground, and the multiple-point ground. The advantages and disadvantages of the systems are analyzed. Diagrams of the individual grounding systems are provided. Author

N75-16722 Bell Telephone Labs., Inc., Whippany, N.J.
THE NATIONAL ELECTRICAL CODE AND IT'S RELATIONSHIP TO THE GROUNDING OF ELECTRONIC SYSTEMS
L. H. Sessler *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 11-30 (For availability see N75-16720 08-33)

The provisions of the 1971 National Electrical Code are discussed with emphasis on the grounding of electrical equipment. The types of equipment to be used for electrical grounding are specified. Diagrams of typical circuits are provided to show the equipment required and the recommended installation of electrical grounds. Examples of violations of the electrical code are included for comparison. Author

N75-16723 Southern Railway Co., Atlanta, Ga.
DEVELOPMENT OF MISSILE SUPPORT SYSTEMS GROUNDING
F. J. Kull *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 31-38 (For availability see N75-16720 08-33)

The application of electrical grounding techniques to the ground support equipment used at the Cape Kennedy Launch Complex is discussed. Problems involved in controlling the grounding circuits are analyzed with emphasis on the corrosion of electric equipment. The safety hazards involved in improper grounding of electric circuits are defined. Problems which were limited to specified down-range stations are included. The present standards for electrical grounding practices are examined. Author

N75-16724 Philco-Ford Corp., Palo Alto, Calif. WDL Div.
APPLIED GROUNDING PRACTICES AROUND THE WORLD
S. R. Crawford *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 39-80 (For availability see N75-16720 08-33)

The conditions encountered in establishing a grounding system in various parts of the world are examined. The means employed to establish a suitable earth connection and grounding distribution system are discussed as well as the methods for evaluating the systems. The intent is to relate the means by which grounding theory has been put into practice under a number of geological and climatological conditions and the methods by which grounding systems are evaluated. Author

N75-16725 Air Force Communications Service, Richards-Gebaur AFB, Mo.
AFCS GROUNDING, BONDING AND SHIELDING PROBLEMS AND CONCERNS
Gerald T. Harris *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 81-108 (For availability see N75-16720 08-33)

The problems involved with electrical grounding of communication and navigation systems used by the Air Force Communications Service are discussed. Specific systems considered are: (1) solid state instrument landing system, (2) closed circuit television, (3) ground control approach facilities, (4) communication stations, and (5) radar transmitters. Drawings and photographs of typical circuits are provided to show specific safety measures. Author

N75-16726 Boeing Aerospace Co., Seattle, Wash.
LARGE SYSTEM GROUNDING
T. H. Herring *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 109-120 refs (For availability see N75-16720 08-33)

Procedures for providing electrical grounding installations for large structures are discussed. The problems involved in grounding specific types of equipment are described. Diagrams of typical grounding practices which have been found to be effective are provided. The characteristics of ground plane and horizontal isolation are analyzed. The subjects considered include the following: (1) circuit grounding, (2) general structure bonding, and (3) earth connection for electronics. Author

N75-16727 Martin Marietta Aerospace, Denver, Colo.
PROTECTION OF COMPUTERS
Robert W. Ellison *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 121-130 (For availability see N75-16720 08-33)

Procedures for protecting computer circuits from the effects of electromagnetic interference are discussed. The grounding of circuits to insure that excessive transient voltages will not affect the computer operation is described. The requirements which must be observed for the construction and installation of building equipment are defined. A susceptibility test to determine the effectiveness of the grounding procedures is examined. Author

N75-16728 Boeing Aerospace Co., Seattle, Wash.
A NATIONAL POLICY ON GROUNDING
Walter D. McKerchar *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 131-134 (For availability see N75-16720 08-33)

An approach to establishing a national policy on the grounding of electric circuits is proposed. Reference is made to various standard specifications which have proven ineffective with time and new products. It is recommended that a committee examine the problem and make recommendations for the establishment of new grounding specifications. Author

N75-16729 National Aviation Facilities Experimental Center, Atlantic City, N.J.
GROUNDING SURVEYS OF FAA INSTALLATIONS
Kenneth E. Nicholls *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 135-148 (For availability see N75-16720 08-33)

A survey was conducted to determine the effectiveness of electrical grounding procedures in ground stations operating air traffic control equipment. The types of equipment used in the ground stations are described. The method for conducting the grounding survey is reported. Examples of the data obtained during the survey are presented. A diagram of a typical grounding installation for electronic digital equipment cabinets is provided. Author

N75-16730 Federal Aviation Administration, Washington, D.C. System Research and Development Service.
A SIGNAL GROUNDING TECHNIQUE FOR AIR ROUTE TRAFFIC CONTROL CENTERS
Harold F. Barrett *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 149-158 (For availability see N75-16720 08-33)

The susceptibility of automated air traffic control systems to transient voltages and voltage surges is discussed. The analog and digital environments within the ground station which can be adversely affected by the electromagnetic interference are identified. The tests conducted of the systems and subsystems and the problems encountered are reported. A diagram of a digital environment configuration to show the proposed solution to the problem is included. Author

N75-16731 Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
GROUNDING STANDARDS FOR AIR TRAFFIC CONTROL FACILITIES
Hugh W. Denny *In its* FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 159-170 refs (For availability see N75-16720 08-33)

The development of standards for grounding, bonding, and shielding of air traffic control facilities to prevent damage to electronic equipment and to reduce danger to personnel is discussed. The program resulted in the publication of two handbooks to be used as a guide to assist contractors in the proper installation of the electronic equipment. The existing codes and requirements are analyzed to establish the prescribed limits. A diagram of a signal reference network is provided to show typical grounding practices. Author

N75-16732 Georgia Power Co., Atlanta.
DESIGN AND APPLICATION OF GROUND FIELDS IN POWER SUBSTATIONS
H. S. Fortson and Shashi G. Patel *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 171-182 (For availability see N75-16720 08-33)

The characteristics of ground-grids for electric power substations are discussed. The steps to be followed in achieving satisfactory grounding of the station are defined as: (1) soil resistivity test, (2) design considerations, (3) installation technology, and (4) final evaluation of effectiveness. Examples of the steps are presented. Diagrams of typical power station installations are included. Author

N75-16733 Biddle (James G.) Co., Plymouth Meeting, Pa.
GETTING DOWN TO EARTH OR HOW TO BECOME WELL-GROUNDED IN EARTH RESISTANCE TESTING
J. L. Hayes *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 183-204 refs (For availability see N75-16720 08-33)

The techniques and rationale for grounding electric circuits are discussed. The characteristics of adequate grounding systems for alternating current and direct current installations are analyzed. The factors which determine the resistivity of soils used for grounding purposes are described. Mathematical models are developed to establish the characteristics of soils used for grounding purposes. Diagrams are provided to show proper and improper grounding installations. Author

N75-16734 Joslyn Electronic Systems, Goleta, Calif.
EFFECTIVE GROUNDING OF LIGHTNING SURGES IN LAND BASED COMMUNICATION FACILITIES
David Bodle and Alwyn deSouza *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 205-228 refs (For availability see N75-16720 08-33)

Procedures for grounding communication equipment to prevent damage from lightning are discussed. The types of grounds in common use at equipment centers are defined. The reduction of inductive voltages in grounding systems is analyzed. Examples of poor grounding practices are presented and application of the basic principles is included. Design considerations other than electrical are examined. Author

N75-16735 Stanford Research Inst., Menlo Park, Calif.
SIGNAL COMMON AND ELECTRICAL GROUNDING
E. F. Vance *In* Georgia Inst. of Tech. FAA/Georgia Inst. of Tech. Workshop on the Grounding of Electron. Systems Mar. 1974 p 229-238 refs (For availability see N75-16720 08-33)

Procedures for grounding buildings to prevent electromagnetic interference and electrostatic transfer are discussed. The effect of connecting signal common of an electronic system is described. The factors which contribute to the requirements for a low grounding impedance are defined. Diagrams are provided to show the proposed and current practice for grounding the signal common. Author

N75-16736*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THERMOELECTRIC OUTER PLANETS SPACECRAFT (TOPS) ELECTRONIC PACKAGING AND CABLING DEVELOPMENT SUMMARY REPORT
R. H. Dawe and J. C. Arnett 15 Dec. 1974 94 p refs
(Contract NAS7-100)
(NASA-CR-142087; JPL-TM-33-716) Avail: NTIS HC $4.75 CSCL 09C

Electronic packaging and cabling activities performed in support of the Thermoelectric Outer Planets Spacecraft (TOPS) Advanced Systems Technology (AST) project are detailed. It describes new electronic compartment, electronic assembly, and module concepts, and a new high-density, planar interconnection technique called discrete multilayer (DML). Development and qualification of high density cabling techniques, using small gage wire and microminiature connectors, are also reported. Author

N75-16737*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
IMPLEMENTATION OF THE 64-METER-DIAMETER ANTENNAS AT THE DEEP SPACE STATIONS IN AUSTRALIA AND SPAIN
K. P. Bartos, H. B. Bell, H. P. Phillips, B. M. Sweetser, and O. A. Rotach 15 Jan. 1975 67 p
(Contract NAS7-100)
(NASA-CR-142091; JPL-TM-33-692) Avail: NTIS HC $4.25 CSCL 09E

The management and construction aspects of the Overseas 64-m Antenna Project in which two 64-m antennas were constructed at the Tidbinbilla Deep Space Communications Complex in Australia, and at the Madrid Deep Space Communications Complex in Spain are described. With the completion of these antennas the Deep Space Network is equipped with three 64-m antennas spaced around the world to maintain continuous coverage of spacecraft operations. These antennas provide approximately a 7-db gain over the capabilities of the existing 26-m antenna nets. The report outlines the project organization and management, resource utilization, fabrication, quality assurance, and construction methods by which the project was successfully completed. Major problems and their solutions are described as well as recommendations for future projects. Author

N75-16738*# Ion Physics Corp., Burlington, Mass.
ELECTRON GUN TEST REPORT
[1974] 91 p
(Contract NAS9-10399)
(NASA-CR-141606) Avail: NTIS HC $4.75 CSCL 09C

Shock and vibration tests were performed to determine the electron optical properties of the electron gun. The test procedure included complete mechanical inspection including a dimensional check of all critical parts. Electrical inspection involved tests for dielectric strengths and element to element leakage resistance. All test circuits and equipment for each test are specified in the test plan. M.C.F.

N75-16739*# Varian Associates, Palo Alto, Calif.
DESIGN, CONSTRUCTION AND EVALUATION OF A 12.045 GHz, 2.0 kW-cw PERMANENT-MAGNET FOCUSED KLYSTRON AMPLIFIER Final Report
J. M. Nishida Feb. 1975 53 p refs
(Contract NAS3-14393)
(NASA-CR-134761) Avail: NTIS HC $4.25 CSCL 09E

An analytical and experimental program to demonstrate the technical feasibility of a lightweight, high-efficiency, 1-2 kW cw, permanent magnet focused klystron operating at 12.0 GHz was described. The design is based on use of a samarium-cobalt permanent magnet for focusing of the electron beam and choice of the most optimum parameters for maximum efficiency. A filter-loaded output circuit is used for the required bandwidth. The design incorporates a collector which is demountable from the tube to facilitate multistage depressed collector experiments, permitting replacement with a NASA-designed axisymmetric, electrostatic collector for linear beam microwave tubes. A further requirement is that the focusing field between the last interaction gap and the collector decay in a prescribed manner referred to as adiabatic expansion. Author

N75-16740*# Kanner (Leo) Associates, Redwood City, Calif.
FUNDAMENTALS AND APPLICATIONS OF THE ROTATING RING DISK ELECTRODE
A. Fujishima and K. Honda Washington NASA Jan. 1975 33 p refs Transl. into ENGLISH from Denki Kagaku Oyobi Kogyo Butsuri Kagaku (Japan), v. 42, no. 5, 1974 p 213-222
(Contract NASw-2481)
(NASA-TT-F-16137) Avail: NTIS HC $3.75 CSCL 09C

A review of the Japanese, United States, and European literature on the theory and applications of the rotating ring-disk electrode is presented. The research discussed includes the rate of capture and reaction mechanisms; the applications of the system to research in such areas as reduction of oxygen, electrodeposition of metals and alloys and organic electrode reactions; and photoelectrode reactions. S.C.

N75-16741# Communications Research Centre, Ottawa (Ontario).
A LIGHT AIRCRAFT SECONDARY RADAR TRANSPONDER
W. D. Hindson, D. C. Barnes, F. R. Cross, N. R. Fines, R. H.

Martin, A. L. Poirier, and G. M. Royer Jun. 1973 73 p refs (DRB Proj. 38-01-50)
(CRC-1237; DRB-TELS-17) Avail: NTIS HC $4.25

A secondary radar transponder was fabricated as part of a feasibility test of a concept for increasing flight safety near airports by the mandatory use of low-powered transponders on all light aircraft. A detailed description is provided of the design and fabrication of the all-solid-state developmental transponder. Seven flight trials of the equipment support the conclusion that a low-powered transponder would greatly reduce the light aircraft problem near airports. Author

N75-16742# Philco-Ford Corp., Willow Grove, Pa. Communication Systems Div.
FAA PRINTED CIRCUIT BOARD ANALYSIS: COMPREHENSIVE ANALYSIS Final Report, task 1C
Gerald L. Ginsberg Dec. 1973 83 p refs
(Contract DOT-FA72WAI-3000)
(AD-781798; FAA-RD-74-109) Avail: NTIS HC $4.00

Based on the results of the data collected on FAA printed circuit boards the effect was investigated of standard printed circuit board size requirements on existing FAA equipment. The analysis takes into account FAA maintenance and logistic systems. It was found that significant benefits can be accrued if parameters, in addition to the board size, are properly standardized and applied. Author

N75-16743# Rome Air Development Center, Griffiss AFB, N.Y.
FAA LIGHTNING PROTECTION STUDY: LIGHTNING PROTECTION DEVICES Final Report, Nov. 1972 - 31 Jan. 1974
Chin-Lin Chen Apr. 1974 84 p refs
(Contract DOT-FA72WAI-356)
(AD-781319; FAA-RD-74-104) Avail: NTIS HC $4.00

The purpose of the lightning protection study is to determine the degree of susceptibility of the Federal Aviation Administration electronic systems to induced electromagnetic pulse effects due to lightning, and to propose protective devices adequate for low voltage electronic systems. This report covers one phase of the study; the lightning protective devices. This report consists of five chapters on introductory remarks and definition of terms, gas discharge transient protectors, semiconductor breakdown diodes, metal-oxide varistors, and deployment and retrofit of protective devices. Author

N75-16744# Philco-Ford Corp., Willow Grove, Pa. Communication Systems Div.
FAA PRINTED CIRCUIT BOARD ANALYSIS: COST VS. BENEFIT STUDY Final Report
Gerald L. Ginsberg Dec. 1973 108 p
(Contract DOT-FA72WA-3000)
(AD-781857; FAA-RD-74-111) Avail: NTIS HC $4.50

The trade-offs associated with the items considered for inclusion in the standard and the specific details that could be standardized to provide a specification which would ensure that resultant equipment reflect minimized life cycle cost are defined. The areas covered include the types of equipment and systems procured by the FAA; state-of-the-art printed circuit board complexity and potential developments; board size; types of connectors; thermal cooling considerations; backplane wiring systems; testing interface; repair considerations; logistics and reliability. Author

N75-16745*# National Aeronautics and Space Administration. Pasadena Office, Calif.
THE 3-5 PHOTOCATHODE WITH NITROGEN DOPING FOR INCREASED QUANTUM EFFICIENCY Patent Application
Lawrence W. James, inventor (to NASA) (Varian Assoc.) Filed 27 Dec. 1974 26 p Sponsored by NASA
(Contract DOT-TSC-95)
(NASA-Case-NPO-12134-1; US-Patent-Appl-SN-536785) Avail: NTIS HC $3.75 CSCL 09C

Photocathodes are described which improve quantum efficiency by increasing the product of the optical absorption coefficient and the diffusion length of the below-bandgap absorption, without an offsetting reduction in escape probability. The photocathode is supported on a conductive electrode in an infrared image intensifier tube and is made of 3-5 semiconductor material doped with an acceptor and nitrogen, a column-5 isoelectronic element. This produces a spatially localized energy level at just below the conduction band similar to a donor level at which optical transitions can occur, thus increasing the absorption coefficient without compensation of the acceptor dopant. It was found that a suitable activation layer on the electron emission surface of the semiconductor material lowers the work function of the photocathode. Emitted electrons are accelerated by a relatively high voltage applied via accelerating electrodes, and focused onto a fluorescent screen. NASA

N75-16746*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH TEMPERATURE CAPACITOR Patent Application
Russell A. Lindberg, inventor (to NASA) Filed 28 Jan. 1975 9 p
(NASA-Case-LEW-11938-1; US-Patent-Appl-SN-544611) Avail: NTIS HC $3.25 CSCL 09A

A capacitor is described which can be used in environments where the temperature is as high as 1500 C (2732 F). The capacitor comprises a dielectric platelet of BeO which has radially extending tabs. Electrodes of iridium having no more than 10 parts per million (ppm) of oxygen and preferably less than 1 ppm are bonded to the platelet and include end portions which provide contacts. These contacts provide electrical connections when a plurality of capacitors are stacked to obtain increased capacitance. The attachment of the electrodes to the dielectric platelet is achieved by off-sputtering the surfaces of the platelet to obtain a surface texture ratio. The electrodes are then deposited by sputtering procedures to a thickness of 2500 to 4000 angstroms. NASA

N75-16747*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CONNECTOR Patent Application
Donald E. Pizzeck, inventor (to NASA) Filed 10 Feb. 1975 7 p
(NASA-Case-LAR-11709-1; US-Patent-Appl-SN-548468) Avail: NTIS HC $3.25 CSCL 09A

A connector is described for connecting circuits on different layers of a multilayer printed circuit board through a hole in the board. The connector is a hollow cylindrical conductor made from a resilient material such as beryllium copper or spring steel. A slit in the conductor and a plurality of sharp teeth located on the outside of the conductor extend the full length of the conductor. The conductor has a slightly larger outside diameter than the diameter of the hole. It was found that when the connector is forced into the hole, the springback (resiliency) of the connector forces the teeth against the circuits on the printed circuit board and provides a positive connection between the circuits. NASA

N75-16748*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INRUSH CURRENT LIMITER Patent Application
Robert A. Kichak, inventor (to NASA) Filed 6 Jan. 1975 16 p
(NASA-Case-GSC-11789-1; US-Patent-Appl-SN-538982) Avail: NTIS HC $3.25 CSCL 09E

A control circuit is described for limiting current surges and the rate of current rise during the application of power to the converter from the power source. The control circuit comprises a control transistor whose collector and emitter are connected to the dc power source and the input to the converter. Control means are connected to the control transistor to increase its conduction after the application of power from the dc power source. A feedback circuit is provided to limit the power necessary to maintain the control transistor in saturation. The control transistor and associated circuitry function as a time variable current limiter in the active region and as a saturated switch in the steady-state mode. Advantages provided by utilization of this control circuit are a simple, reliable, and effective circuit for suppressing turn-on current transients of dc-to-dc power converters; substantial weight, size, and cost reduction; and improved performance. Official Gazette of the U.S. Patent Office

N75-16749*# Auburn Univ., Ala. Engineering Experiment Station.
A STABLE, LINEAR FREQUENCY-MODULATED OSCILLATOR, PART 1 Final Report

M. A. Honnell Sep. 1974 50 p refs
(Contract NAS8-26193)
(NASA-CR-120584; AU8-26193-FRI-Pt-1) Avail: NTIS HC $3.75 CSCL 09E

The development of a push-pull frequency-modulated oscillator employing field-effect transistors is described. The advantages of field-effect transistors for use in a frequency-stable oscillator are presented. Linearization of the frequency deviation was accomplished by utilizing the square-law characteristic of an FET used as a modulating amplifier. The push-pull oscillator model produced a linear frequency deviation of more than 10 MHz at a center frequency of approximately 100 MHz. Output power is within 0.6 db of a nominal +8.5 dbm over the desired frequency range, and the modulation bandwidth is dc to 10 MHz. Frequency variation with temperature after compensation with a negative-temperature-coefficient capacitor is within + or - 0.05% from 0 to 60 C. Author

N75-16750*# Auburn Univ., Ala. Engineering Experiment Station.
A DIGITAL MIXER, PART 2 Final Report
M. A. Honnell Sep. 1974 36 p
(Contract NAS8-26193)
(NASA-CR-120585; AU8-26193-FRI-Pt-2) Avail: NTIS HC $3.75 CSCL 09E

A study was made to determine the characteristic response of D flip-flop digital logic units used as mixing devices for telemetry applications. The D flip-flop is shown to perform the mixing operation under a variety of input frequency conditions. The output signal is a rectangular wave whose long term average frequency is the desired difference frequency. The output signal contains frequency jitter which is a function of the relationship between the two input frequencies. The seriousness of the jitter depends on the application. Author

N75-16751*# Martin Marietta Aerospace, Denver, Colo.
EVALUATION OF WET TANTALUM CAPACITORS AFTER EXPOSURE TO EXTENDED PERIODS OF RIPPLE CURRENT, VOLUME 2
C. M. Ward Washington NASA Feb. 1975 43 p ref
(Contract NAS1-9000)
(NASA-CR-2487; TN-3770201-Vol-2) Avail: NTIS HC $3.75 CSCL 09A

The application of tantalum capacitors in the Viking Lander includes dc voltage and ripple current electrical stress, high temperature during nonoperating times (sterilization), and high vibration and shock loads. The capacitors must survive these severe environments without any degradation if reliable performance is to be achieved. A test program was established to evaluate both wet-slug tantalum and wet-foil capacitors under conditions accurately duplicating actual Viking applications. Test results of the electrical performance characteristics during extended periods of ripple current, the characteristics of the internal silver migration as a function of extended periods of ripple current, and the existence of any memory characteristics are presented. Author

N75-16752# Sandia Labs., Albuquerque, N.Mex.
USE OF FLUOROCARBON GASES TO PREVENT ARCOVER IN DC CAPACITORS
D. H. Loescher 1974 12 p refs Presented at the Conf. on Elec. Insulation and Dielec. Phenomena, Downington, Pa., 21 Oct. 1974 Sponsored by AEC
(SLA-74-5321; Conf-741008-2) Avail: NTIS HC $3.25

The use of Fr-14 and Fr-116 to increase the margin arcover voltage in dry Mylar energy storage capacitors is investigated. It is found that pressurization of capacitors with Fr-14 results in a small increase in arcover voltage. However, pressurization with Fr-116 results in arcover voltages 1.5 to 2.5 times larger than obtained in air. Author (NSA)

N75-16753# Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study.
PROPAGATION OF IMPULSES ON A RC TRANSMISSION LINE
S. Watanabe and K. Husimi 27 May 1974 19 p
(INS-TL-124) Avail: AEC Depository Libraries

Resistance-capacitance (RC) transmission lines are used to delay networks of the single wire proportional counter and the solid state position detector. The propagations of voltage and current impulses on the RC transmission line are analyzed in the condition that the transmission line is ideally terminated or infinitely long. Author (NSA)

N75-16754# Brookhaven National Lab., Upton, N.Y.
UNIVERSITY'S ROLE IN RESEARCH ON SUPERCONDUCTING POWER TRANSMISSION
E. B. Forsyth [1974] 6 p refs Presented at Conf. on Res. in Elec. Transmission and Distribution, Buffalo, 30 Sep. 1974 Sponsored by AEC
(BNL-19133; Conf-740936-1) Avail: NTIS HC $3.25

Power transmission by superconducting cables has enormous potential for the utility industry. It has to be demonstrated that it will become a viable and economically competitive technology; development aimed at this goal by major research establishments has exposed numerous research problems suitable for investigation by well qualified university departments without requiring large expenditures for equipment. What is missing is an organizational structure to relate work to the primary goals to monitor progress, and to influence the funding decisions of the major agencies. This does not seem difficult to set up, but continued success will require a long-term commitment from the participants. Author (NSA)

N75-16755# Sandia Labs., Albuquerque, N.Mex.
INITIATION OF ELECTRICAL CONTACT ARCING OBSERVED AT POTENTIALS DOWN TO THE MELTING VOLTAGE
R. E. Cuthrell 1974 10 p refs Presented at 20th Ann. Holm Seminar on Electrical Contacts, Chicago, 29 Oct. 1974 Sponsored by AEC
(SLA-74-5125; Conf-741021-1) Avail: NTIS HC $3.25

Results of low-voltage electrical contact arcing experiments are presented. Visible arcs were initiated at potentials down to but not below, the melting potentials for various metals (0.3 to 1.1 volts), whereas the minimum voltage for arcing has been previously assumed to be 11 to 15 volts. Scanning electron microscope photomicrographs show arc pits, melting, and spattering for contacts arced at these low voltages. Circuits were designed to minimize the inductance, and oscilloscope traces of the arcing potentials were obtained. Author (NSA)

N75-16756# California Univ., Livermore. Lawrence Livermore Lab.
LLL TRANSIENT ELECTROMAGNETIC MEASUREMENT FACILITY: A BRIEF DESCRIPTION
R. A. Anderson, J. A. Landt, F. J. Deadrick, and E. K. Miller 9 Aug. 1974 15 p refs Revised Sponsored in part by Defense Nuclear Agency
(Contract W-7405-eng-48)
(UCID-16573-Rev-1) Avail: NTIS HC $3.25

Pulse techniques for various antenna and scattering measurements are provided by advances in sub-nanosecond pulse generation and sampling technology. Data are obtained in the time domain and converted to broad band frequency domain information by the use of the fast Fourier transform. Measurements are obtained in the time interval from the time of incident pulse to time of arrival of the first reflection. This time interval is determined by the size of the ground plane and the length of infinite radiating source. In frequency domain terms, this time interval determines the low frequency cut-off. The upper frequency cut-off is determined by the measuring equipment bandwidth. For the LLL facility the low frequency cut-off is 50 MHz and is extended by experiment modifications and data processing. The upper frequency cut-off is about 3 GHz and is extended to 10 GHz by additional data processing. NSA

N75-16757# Bendix Corp., Kansas City, Mo.
DEFECT DETECTION IN HIGH-DENSITY BRAIDED SHIELDS
E. Belarde Oct. 1974 13 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1122-Rev) Avail: NTIS HC $3.25

Braided cable shields are being evaluated to ensure adequate protection when the cables are exposed to electromagnetic radiation (EMR) fields. This work is divided into two separate

categories. (1) Complete cable coverage helps to provide EMR protection; however, the braid pattern, as well as the braid density, is important. A radiographic method proved satisfactory in this area. (2) Freedom from defects such as those sometimes caused by use or handling is necessary to prevent the cables from picking up extraneous electromagnetic radiation and feeding it to sensitive electronic assemblies. Such defects were successfully located by use of a modified Singer Stoddart Model 500 shielded-enclosure leak-detection system that is often called a sniffer. Although these two systems provided acceptable initial results, other systems are being considered in the interest of the best possible nondestructive inspection methods. Both categories of this work will require additional evaluation before establishing cable-braid nondestructive test procedures that are both reliable and economically feasible. Author (NSA)

N75-16758# Signals Research and Development Establishment, Christchurch (England).
DEVELOPMENT OF A HIGH LEVEL FAST LIMITING SWITCH
C. H. Jones and C. Sedwell Dec. 1973 22 p refs
(SRDE-73024; BR40764) Avail: NTIS HC $3.25

A high level limiting switch was developed for application in logic equipment where the low amplitude asymmetric outputs of normal logic circuit families are a disadvantage. The device is driven from normal TTL type signals to give a symmetrical output swing of approximately plus or minus 14.5 volts. The switching speed at the output is as fast as, if not faster than, the driving waveform. Rise or fall times of better than 30 nsec are typical. The circuit can drive a resistive load passing currents of up to 10 mA without deterioration of the waveform. To accommodate the large voltage swings and the need for high gain short storage time complementary transistors, hybrid fabrication techniques are used. The use of a symmetrical circuit without conventional catching diode networks has resulted in a lower mean power consumption with satisfactory operation over the full temperature range from -40 to +85 C at repetition rates of up to 1 MHz. Author (ESRO)

N75-16759# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
PHYSICAL FUNDAMENTALS OF THE TECHNOLOGY OF SILICON PHOTODIODES WITH METAL-SEMICONDUCTOR CONTACT (SCHOTTKY PHOTODIODES) [PHYSIKALISCHE GRUNDLAGEN DER TECHNOLOGI E VON SILIZIUM - FOTODIODEN MIT METALL-HALBLEITERKONTAKT (NH) (SCHOTTKY-FOTODIODEN)]
Gerfried Felkel, Werner Spaeth, and Helmut Eger Bonn Bundesmin. fuer Forsch. und Technol. Oct. 1974 32 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. und Technol.
(BMFT-FB-T-74-27) Avail: NTIS HC $3.75; ZLDI, Munich 6.30 DM

A method to produce Au-Schottky-photodiodes on n-silicon is described. The measured electrical parameters correspond approximately with the theoretically expected values. On the other hand no high sensitivity could be achieved in the short wavelength spectral region. An inversion layer directly at the metal-semiconductor boundary may be responsible for the low sensitivity in this region. Consequently it is obviously not possible to make Schottky-photodiodes with high sensitivity in the near ultraviolet and simultaneously have a high cutoff frequency.
Author (ESRO)

N75-16760# Siemens A.G., Munich (West Germany). Forschungslaboratorien.
IMPROVEMENTS OF PROPERTIES OF DIELECTRIC MATERIALS FOR HIGH FREQUENCY FILTERS [VERBESSERUNG DER EIGENSCHAFTEN DIELEKTRISCHER MATERIALIEN, INSBESONDERE FUER HOCHFREQUENZ-FILTER]
Helmut Thomann, Friedrich Kuenemund, Hartmut Heydrich, Renate Kuschke, and Hermann Vollhardt Bonn Bundesmin. Fuer Forsch. und Technol. Oct. 1974 51 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. Fuer Forsch. und Technol.
(BMFT-FB-T-74-28) Avail: NTIS HC $4.25; ZLDI, Munich 10.30 DM

Filters for frequencies in the order of 100 MHz can be synthesized using resonators in integrated techniques. The resonators consist of leads and condensers on plates of highly permittive material. Well known temperature independent ceramics with epsilon approximately 40 are unsatisfactory for such high frequencies, but are suitable for basic investigations with slightly higher frequencies. It is shown that ceramic substrates with relatively good temperature response can be made using highly doped BaTi03. Thereby the losses are diminished so far that the ferroelectric material with epsilon approximately 500 is suitable for frequencies up to 100 MHz. Author (ESRO)

N75-16761# European Space Research and Technology Center, Noordwijk (Netherlands).
STABILITY ANALYSIS OF A PWM CONTROLLED DC/DC REGULATOR WITH DC AND AC FEEDBACK LOOPS
A. Capel, J. G. Ferrante, and R. Prajoux (CNRS, Toulouse) 1974 9 p refs Presented at the Electromagnetic Compatibility Symp., Murray Hill, N. Y., 10-12 Jun. 1974
Avail: NTIS HC $3.25

The stability analysis of a buck regulator with dc and ac feedback loops was investigated theoretically for the continuous conduction mode by applying the z-transform method. The analysis was extended to the discontinuous conduction mode by means of an analog computer simulation. These last results were verified successfully on an existing breadboard. It appears that the introduction of the ac loop allows fast transients independent of the output filter parameters and improves the overall stability of the single loop regulator. Author (ESRO)

N75-17204* Boeing Co., Houston, Tex.
SNEAK CIRCUIT ANALYSIS OF INSTRUMENTATION AND CONTROL SYSTEMS
John P. Rankin and Alfred M. Williams *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 167-180 refs (For availability see N75-17188 08-80)
CSCL 09C

N75-17206* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APPLICATION OF NARROW-BAND TELEVISION TO INDUSTRIAL AND COMMERCIAL COMMUNICATIONS
Bernard C. Embrey, Jr. and Glen R. Southworth (Colorado Video, Inc.) *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 189-199 refs (For availability see N75-17188 08-80)
CSCL 17B

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N75-16762 British Library Lending Div., Boston Spa (England).
EXPERIMENTAL INVESTIGATIONS OF THE HEAT TRANSFER TO LIQUID METALS RUNNING IN PARALLEL FLOW THROUGH PIPE BUNDLES
H. Graeber 30 Oct. 1973 54 p Transl. into ENGLISH from Atomkernenergie (Munich), v. 19, no. 1, 1972 p 23-40
(BLL-CE-Trans-6195-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 6 BLL photocopy coupons

An extensive experimental study was carried out for the determination of the relation Nu = f (P sub e, p/d, F sub 0) valid for liquid metals between the Nusselt number, the Peclet number, the pitch-to-diameter ratio and the parameter describing the influence of the axial distribution of the heat flux density. In three pairs of test sections with 31 tubes of d = 12 mm OD arranged in an equilateral triangular lattice of p/d = 1.25, 1.60 or 1.95 both the temperatures of the tube walls and those of the fluid (Na K -44/56) in the center of various subchannels were measured by means of about 80 thermocouples per test section. Author

N75-16763 British Library Lending Div., Boston Spa (England).
MEASUREMENT OF RAPIDLY VARYING LIQUID FLOW-RATES BY MEANS OF ULTRASONIC WAVES
Pierre Alais and Jean-Claude Demarais 29 Oct. 1973 21 p refs Transl. into ENGLISH from Rech. Aerosp. (France), no. 2, Mar. - Apr. 1972 p 61-73
(BLL-NEL-TT-2501-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Convection of an ultrasonic wave by the flow is utilized to study unsteady phenomena in hydraulics. A review of the principal methods in general use is presented along with mechanical and electronic solutions adopted. Results obtained with various-capacity instruments are given. Author

N75-16764*# Michigan State Univ., East Lansing. Div. of Engineering Research.
PRELIMINARY RESULTS FROM AN EXPERIMENTAL INVESTIGATION OF THE INITIAL CONDITION EFFECTS ON A TURBULENT SHEAR LAYER Final Report
John F. Foss 31 Jan. 1975 21 p
(Grant NGR-23-004-089)
(NASA-CR-142072) Avail: NTIS HC $3.25 CSCL 20D

A flow facility to create a plane shear layer from a laminar and a turbulent boundary layer was established. The spread rate parameter for these two conditions was accurately determined. A four percent (maximum), nonturbulent disturbance level exists in the laminar boundary layer. Author

N75-16765# National Aeronautical Establishment, Ottawa (Ontario).
SPATIAL INSTABILITY OF COMPRESSIBLE WAKES WITH THREE-DIMENSIONAL DISTURBANCES
Y. Y. Chan and R. K. Leong Nov. 1974 25 p refs
(NRC-14400; LR-501) Avail: NTIS HC $3.25

The linear spatial stability of a compressible thin turbulent wake bound by two side walls is analyzed by the stability theory of an inviscid shear flow. The disturbance propagating in the wake is assumed to be three dimensional. For free stream Mach numbers up to 2.0, the analysis shows that in the high frequency region the most unstable mode of the wake is induced by two dimensional disturbances. At the low frequency region, the wake is more unstable to three-dimensional disturbances than to two-dimensional ones. Author

N75-16766*# Bucknell Univ., Lewisburg, Pa.
PARTICLE FLOW WITHIN A TRANSONIC COMPRESSOR ROTOR PASSAGE WITH APPLICATION TO LASER-DOPPLER VELOCIMETRY
Barry R. Maxwell Feb. 1975 64 p refs
(Grant NGR-39-027-003)
(NASA-CR-134718) Avail: NTIS HC $4.25 CSCL 20D

A theoretical analysis was conducted of the dynamic behavior of micron size particles moving in the three-dimensional flow field of a rotating transonic axial-flow air compressor rotor. The particle velocity lag and angular deviation relative to the gas were determined as functions of particle diameter, mass density and radial position. Particle size and density were varied over ranges selected to correspond to typical laser-Doppler velocimeter (LDV) flow field mapping applications. It was found that the particles move essentially on gas stream surfaces and that particle tracking is relatively insensitive to the rotor radial coordinate. Velocity lag and angular deviation increased whenever particle size or mass density increased, and particle tracking was more sensitive to a change in particle diameter than to a corresponding change in mass density. Results indicated that velocity and angular deviations generally less than 1 percent and 1 degree could be achieved with 1 gm/cc tracer particles with diameters of 1 micron or less. Author

N75-16767*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
WALL MOUNTED HEAT EXCHANGER CHARACTERIZATION Final Report
B. R. Bullard Jan. 1975 222 p refs
(Contract NAS3-16769)
(NASA-CR-134536; LMSC-D465537) Avail: NTIS HC $7.25 CSCL 20M

Analytical models are presented for describing the heat and mass transfer and the energy distribution in the contents of a cryogenic propellant tank, under varying gravity levels. These models are used to analytically evaluate the effectiveness of a wall heat exchanger as a means of controlling the pressure in the tank during flight and during fill operations. Pressure and temperature histories are presented for tanks varying in size from 4 to 22.5 feet in diameter and gravity levels from 0-1. Results from the subscale test program, utilizing both non-cryogenic and cryogenic fluid, designed to evaluate a tank wall heat exchanger are described and compared with the analytical models. Both the model and test results indicate that a passive tank wall heat exchanger can effectively control tank pressure. However, the weight of such a system is considerably higher than that of an active mixer system. Author

N75-16768*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
TWO DIMENSIONAL TURBULENCE IN INVISCID FLUIDS OR GUIDING CENTER PLASMAS
C. E. Seyler, Jr., Yehuda Salu, David Montgomery, and George Knorr Jan. 1975 58 p refs
(Grant NGL-16-001-043)
(NASA-CR-142129; U-of-Iowa-75-4) Avail: NTIS HC $4.25 CSCL 20D

Analytic theory for two-dimensional turbulent equilibria for the inviscid Navier-Stokes equations is examined mathematically. Application of the technique to electrostatic guiding center plasma is discussed. A good fit is demonstrated for the approach to a predicted energy per Fourier mode obtained from a two-temperature canonical ensemble. Negative as well as positive temperature regimes are explored. Fluctuations about the mean energy per mode also compare well with theory. In the regime of alpha less than zero, beta greater than zero, with the minimum value of alpha plus beta times k squared near zero, contour plots of the stream function reveal macroscopic vortex structures similar to those seen previously in discrete vortex simulations. Eulerian direct interaction equations, which can be used to follow the approach to inviscid equilibrium, are derived. Author

N75-16769*# Technology, Inc., San Antonio, Tex. Life Sciences Div.
BREADBOARD DEVELOPMENT OF A FLUID INFUSION SYSTEM Final Report, 25 Jun. - 25 Dec. 1974
Roy W. Thompson 25 Dec. 1974 40 p
(Contract NAS9-14081)
(NASA-CR-141609) Avail: NTIS HC $3.75 CSCL 20D

A functional breadboard of a zero gravity Intravenous Infusion System (IVI) is presented. Major components described are: (1) infusate pack pressurizers; (2) pump module; (3) infusion set; and (4) electronic control package. The IVI breadboard was designed to demonstrate the feasibility of using the parallel solenoid pump and spring powered infusate source pressurizers for the emergency infusion of various liquids in a zero gravity environment. The IVI was tested for flow rate and sensitivity to back pressure at the needle. Results are presented. J.M.S.

N75-16770*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SYSTEM FOR MEASURING REYNOLDS STRESS IN A TURBULENTLY FLOWING FLUID Patent Application
Dah Yu Cheng, inventor (to NASA) (Santa Clara Univ.) Filed 29 Jan. 1975 22 p Sponsored by NASA
(NASA-Case-ARC-10755-2; US-Patent-Appl-SN-545284) Avail: NTIS HC $3.25 CSCL 14B

A system is described for measuring momentum flux in a turbulent flowing liquid, and for real time measurement of the Reynolds stress wave and the Reynolds stress. The probe introduced into the turbulent fluid to be measured is capable of generating two electrical signals representative of orthogonal velocity components of the fluid. The probe includes a spherical portion attached to an elongated member supported by a viscoelastomeric collar. The ac velocity signals generated by the coils are amplified, integrated, multiplied, and divided by the processing circuit. The signal emanating from a divider is displayed on a scope and fed to a meter which responds to the true rms value of the dc and ac components of the Reynolds stress wave. The time averaged output of the meter is the Reynolds stress. Probe position control simultaneously moves the probe along

one axis and moves the pen of the plotter along the abscissa.
NASA

N75-16771*# Kanner (Leo) Associates, Redwood City, Calif.
SUPERSONIC FLUID FLOW IN RADIAL DIFFUSERS OF CENTRIFUGAL COMPRESSORS
M. Skvor Washington NASA Mar. 1975 15 p refs Transl. into ENGLISH from Strojnicky Cas. (Czechoslovakia), v. 24, no. 2-3, 1973 p 143-155
(Contract NASw-2481)
(NASA-TT-F-16182) Avail: NTIS HC $3.25 CSCL 20D

A summary is presented of existing types of diffuser designs. Solutions are found for the development of the flow in a radial vaneless diffuser and the passage through a circular shock wave in the region m greater than 1. The flow is classified on the basis of the characteristic number m (radial component of Mach number) and the critical flow angle alpha. Solutions are obtained for the shockless flow through a radial cascade, the passage of shock waves and weak disturbances through a source-vortex flow and their interaction. The supersonic part of the flow field behind the shock wave is calculated by the method of characteristics. The results obtained are illustrated graphically in velocity diagrams for the airflow. Author

N75-16772*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NUMERICAL SOLUTION OF THE HYPERSONIC VISCOUS-SHOCK-LAYER EQUATIONS FOR LAMINAR, TRANSITIONAL, AND TURBULENT FLOWS OF A PERFECT GAS OVER BLUNT AXIALLY SYMMETRIC BODIES
E. C. Anderson (Old Dominion Univ. Res. Found.) and James N. Moss Washington Feb. 1975 37 p refs
(NASA-TN-D-7865; L-9763) Avail: NTIS HC $3.75 CSCL 20D

The viscous shock layer equations applicable to hypersonic laminar, transitional, and turbulent flows of a perfect gas over two-dimensional plane or axially symmetric blunt bodies are presented. The equations are solved by means of an implicit finite difference scheme, and the results are compared with a turbulent boundary layer analysis. The agreement between the two solution procedures is satisfactory for the region of flow where streamline swallowing effects are negligible. For the downstream regions, where streamline swallowing effects are present, the expected differences in the two solution procedures are evident. Author

N75-16773# Sandia Labs., Albuquerque, N.Mex. Plowshare and Transducer Technology Div.
SENSIBLE HEAT STORAGE IN LIQUIDS
T. D. Brumleve Jul. 1974 41 p refs
(Contract AT(29-1)-789)
(SLL-73-0263) Avail: NTIS HC $3.75

Initial investigations are presented covering several aspects of thermal energy storage as sensible heat in liquids. Heat loss to the environment from insulated tanks and underground mined cavities is characterized as a function of size, temperature difference, and time. Storage and interchange of hot and cool liquids within a single storage volume is discussed along with the advantages of preventing mixing. A technique for minimizing mixing through the use of a thermocline at the interface between hot and cool liquids is presented together with the mechanisms which degrade energy availability. Author (NSA)

N75-16774# Los Alamos Scientific Lab., N.Mex.
CONCEPTUAL DESIGN OF A HEAT PIPE METHANATOR
W. A. Ranken Apr. 1974 11 p refs
(Contract W-7405-eng-36)
(LA-5596) Avail: NTIS HC $3.25

A conceptual design of a unit for converting synthesis gas from coal to methane is described. Gravity-return heat pipes are used in a simple configuration that provides for removing the reaction heat from the methanation-promoting catalyst, transmitting a portion of this heat to an incoming-gas preheat section, and delivering the remainder to a steam generation unit. Problems peculiar to the use of heat pipes for this purpose are considered, and methods for solving or circumventing these problems are discussed. Author (NSA)

N75-16775# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.
HEAT TRANSFER TO LIQUID HELIUM IN VERTICAL COOLING CHANNELS WITH CONSTANT AND PULSED HEAT FLOW
C. Schmidt and P. Turowski May 1974 24 p refs In GERMAN; ENGLISH summary
(KFK-1958) Avail: AEC Depository Libraries HC $4.25

Data on heat transfer to liquid helium were measured in vertical cooling channels of 10 cm length with various cross sections and surfaces. The maximum heat flux for nucleate boiling is independent of surface treatment. Surprisingly, large peaks in temperature rise were found before nucleate boiling sets in. Distinct hysteresis effects appeared in connection with rough surfaces. Studies of the temperature behavior involving the switching-on of a constant heating power and experiments with pulsed thermal loads showed that film boiling does not start until after some short delay. Therefore, larger maximum heating powers may be tolerated in pulsed operation. Author (NSA)

N75-16776# Sandia Labs., Albuquerque, N.Mex.
ANALYSIS OF INCOMPRESSIBLE FLOW IN POROUS MEDIA
A. R. Shouman and A. B. Donaldson Oct. 1974 22 p refs
(Contract AT(29-1)-789)
(SAND-74-0191) Avail: NTIS HC $3.25

The relationship between the various parameters that govern flow through porous media and the basis of the D'Arcy and Forchheimer expressions for these relationships are discussed. Specifically, the nonlinear term in the Forchheimer equation is related to internal expansion and contraction effects and to the entrance and exit effects at the boundary of the specimen. A generalized Forchheimer equation, developed in this paper, is used in conjunction with experimental data for water flow through polyurethane foam to establish its flow characteristics. Author (NSA)

N75-16777# Oak Ridge National Lab., Tenn.
VIBRATIONAL FREQUENCY OF A NONCONDUCTING CHARGED LIQUID DROP
C. Y. Wong and H. H. K. Tang 1974 6 p refs Presented at Intern. Colloq. on Drops and Bubbles, Pasadena, Calif., 28 Aug. 1974 Sponsored by AEC
(Conf-740837-2) Avail: NTIS HC $3.25

The vibration of a nonconducting liquid drop endowed with a surface charge is considered, in supplement to the well-known case of a conducting liquid drop studied by Lord Rayleigh in the last century. It is assumed that there is no charge conduction except by hydrodynamical transport due to the flow motion. It is found that the surface flow is of such a form that the charge again maintains an electrostatic equipotential at the surface of the drop at all instants of the vibrational motion, and the same Rayleigh result is obtained. The Rayleigh result is applicable to more general classes of liquid drops, irrespective of the conductivity of the liquid in these two limits.
Author (NSA)

N75-16778# Los Alamos Scientific Lab., N.Mex.
TEST PROBLEMS FOR HYDROCODES
W. Fickett and W. C. Rivard Aug. 1974 32 p refs
(Contract W-7405-eng-36)
(LA-5479) Avail: NTIS HC $3.75

A collection of exact solutions to the inviscid (Euler) equations of motion is presented for use in testing finite-difference calculations. The emphasis is on problems involving solid explosives and inerts. Author (NSA)

N75-16779# California Univ., Livermore. Lawrence Livermore Lab.
DYNAMICS OF AEROSOLS AND HYDROSOLS: CLASS NOTES
Frank A. Morrison, Jr. 1974 246 p refs
(Contract W-7405-eng-48)
(UCID-16575) Avail: NTIS HC $7.50

Aerosols are defined as a small particle suspended in air. Hydrosols are defined as small particles suspended in water. Many analyses and methods of analysis apply equally well to aerosols or hydrosols and conclusions depend on the magni-

tudes of physical properties in gases and in liquids. Solid particles are considered in gas or in liquid, liquid particles or drops in gas or in liquid, and gaseous particles or bubbles in liquids. Dispersion aerosols, liquid aerosols, and dusts are defined. Three section titles are: some fluid kinematics and dynamics; some geometry and notation; axisymmetric flow; and motion in a continuum. NSA

N75-16780# Queen Mary Coll., London (England).
SLR TEMPERATURE MEASUREMENTS IN THE SUPERSONIC EXPANSION OF NITROGEN IN A SHOCK-TUNNEL
Michael J. Lewis and Leonard Bernstein Aeron. Res. Council 1974 37 p refs Supersedes ARC-34951 Sponsored by Min. of Technol.
(ARC-CP-1294; ARC-34951) Avail: NTIS HC $3.75; HMSO 65p; PHI $2.75

Temperature measurements, using the spectrum line reversal method, are presented for the expansion of nitrogen in nozzles attached to a shock tube. The measurements were made at a ratio of 8.5 in a two dimensional nozzle and at an area ratio of 152 in a conical nozzle. Initial conditions were such that at the entrance to the nozzles the temperature ranged between 2500 and 5300 K and the pressure between 1 and 30 atmospheres. Temporal variations of temperature were found in the nozzle flow, which are similar to those previously measured at the nozzle entrance. The apparent de-excitation rate of the nitrogen vibrational mode is up to 100 times faster than shock excitation data suggest. Author (ESRO)

N75-16781# Ernst-Mach-Inst., Freiburg (West Germany).
EXPERIMENTS FOR THE SIMULATION OF SHOCK WAVES AT ATOMIC EXPLOSIONS AND THEIR PROPAGATION IN TUBES [VERSUCHE ZUR SIMULATION VON LUFTSTOSSWELLEN BEI ATOMEXPLOSIONEN UND ZUR FORTPFLANZUNG SOLCHER WELLEN IN ROHREN]
H. P. Mehlin and M. Froboese Apr. 1974 117 p refs In GERMAN; ENGLISH summary Sponsored jointly by Direc. Tech. des Eng. and Bundesmin. der Verteidigung Prepared jointly with Inst. Franco-Allemand de Rech.
(Rept-3/74) Avail: NTIS HC $5.25

Shock waves were generated in a tube in three different manners in order to simulate atomic explosions: detonation of bars of explosives; firing of explosive mixtures of methane and air; and expansion of compressed air. The pressure-time histories of the shock waves were registered along the length of the tube. To obtain spreading of the boundary of the media at the detonations of explosives, the temperature variations were measured at the contact surface between driver and working gas. The oscillograms p(t) and diagrams p(r) obtained are discussed. ESRO

N75-16782# Arbeitsgruppe fuer Ballistische Forschung, Weil am Rhein (West Germany).
SPECTROSCOPICAL TEMPERATURE MEASUREMENTS IN THE MUZZLE FIRE OF ARTILLERY RIFLES [SPEKTROSKOPISCHE TEMPERATURMESSUNGEN IM MUENDUNGSLEUCHTEN EINES INFANTERIEGEWEHRES]
G. Klingenberg Jul. 1974 94 p refs In GERMAN
(ABF-2/74) Avail: NTIS HC $4.75

Modified spectroscopic line inversion techniques were used to determine the local and time-based temperature distribution in the flow field outside the muzzle of a rifle immediately after firing. Excitation temperature measurements of Na and K lines in muzzle fires are discussed, and the gas temperature in the various flow ranges is dealt with. ESRO

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-16783* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DUAL WAVELENGTH SCANNING DOPPLER VELOCIMETER Patent
Kenneth L. Rloff, George R. Grant, and William D. Gunter, Jr., inventors (to NASA) Issued 14 Jan. 1975 8 p Filed 18 Apr. 1973 Supersedes N73-21390 (11 - 12, p 1405)
(NASA-Case-ARC-10637-1; US-Patent-3,860,342; US-Patent-Appl-SN-352383; US-Patent-Class-356-28) Avail: US Patent Office CSCL 14B

A laser Doppler velocimeter is described simultaneously measuring localized orthogonal velocity components in a fluid stream without perturbation of the flowfield. A first pair of beams of a first common wavelength and a second pair of beams of a second common wavelength are derived from a single laser source, directed along a single optical axis. The respective beams of each pair of beams are disposed parallel to the axis, symmetrically about the axis, and are positioned orthogonally about the axis relative to each other. The four beams are then focused upon a selected test volume within the flowfield. Light scattered at that point is collected by an appropriate optical system and focused onto photodetectors which develop electrical output signals commensurate with the orthogonal velocity components at the test point. Official Gazette of the U.S. Patent Office

N75-16784 British Library Lending Div., Boston Spa (England).
MEASUREMENTS WITH A MICROTHERMOCOUPLE OF THE LOCAL VOID FRACTION AND THE TEMPERATURE OF THE LIQUID AND VAPOR IN TWO-PHASE FLOW WITH PHASE CHANGE
J.-M. Delhaye, R. Semeria, and J.-C. Flamand 29 Oct. 1973 33 p refs Transl. into ENGLISH from French report, CEA-R-4302
(BLL-WH-Trans-352-(9091.9F); CEA-R-4302) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

A phase-indicating microthermocouple is developed to study the local structure of two-phase flows with change of phase. The temperatures of the liquid and of the vapor as well as the local presence ratio of a phase are obtained from the analysis of the signals obtained from the microthermocouple. Experiments of boiling in a tank, of local boiling with forced convection, and of flow with self-vaporization are described. Author

N75-16785 Polish Academy of Sciences, Warsaw.
DIGITAL METER AND RECORDER OF BASIC FREQUENCY OF A LANGUAGE'S HARMONIC SIGNALS [CYFROWY MIERNIK I REJESTRATOR CZESTOTLIWOSCI PODSTAWOWEJ SYGNALOW HARMONICZNYCH MOWY]
A. Niedzwiecki and W. Mikiel 7 Dec. 1973 40 p refs In POLISH
(Rept-48/1973) Avail: Issuing Activity

Computer techniques and digital measuring instruments were used to investigate language signals and signal frequencies. Other topics discussed include frequency measurement, signal analyzers, speech recognition, and vowel formants. Transl. by M.J.S.

N75-16786*# Technicolor, Inc., Houston, Tex.
SENSITOMETRIC CROSSOVER FOR 2485 IN BALLOON OBSERVATION ASTRONOMICAL PROGRAM
Lincoln Perry Jan. 1973 9 p
(Contract NAS9-11500)
(NASA-CR-141601; TB-73-1) Avail: NTIS HC $3.25 CSCL 14E

Photographic film processing support is described for the CREPE 4 project, a high-altitude balloon study of cosmic radiation. The processing procedures are summarized, and recommendations are made for the size and thickness of film to be used in future projects. N.E.R.

N75-16787# Japan Broadcasting Corp., Tokyo.
GAS-DISCHARGE-PANEL TELEVISION DISPLAY
Ryuichi Kaneko, Minori Yokozawa, Shigemitsu Suzuki, and Takeo Kamegaya Jul. 1974 18 p refs
(NHK-Labs-Note-178) Avail: NTIS HC $3.25

A television oriented dc gas discharge panel almost the size of a television picture was fabricated. The display panel has an aspect ratio of 3 : 4, and its picture size is 107mm by 143mm,

with picture elements of 90 rows by 120 columns. The color displayed is an orange-red monochrome. A television display using the experimental display panel is digitally organized, and the panel is driven by PWM pulses. The displayed picture showed a maximum luminance of 90 nits and a contrast ratio of 47 : 1, with ambient light. Author

N75-16788*# Scientific Translation Service, Santa Barbara, Calif.
DEVICE FOR MEASURING THE TEMPERATURE FIELDS OF ROTORS OF HIGH rpm GAS TURBINES
Ye. P. Dyban, S. K. Rudkin, V. Yu. Khavin, and N. N. Shelmenko Washington NASA Jan. 1975 8 p Transl. into ENGLISH from Tepl. Napryazh. Elementakh Konstrukt. (USSR), no. 14, 1974 p 139-142
(Contract NASw-2483)
(NASA-TT-F-16135) Avail: NTIS HC $3.25 CSCL 14B

A device is described which reliably and precisely measures the temperature of turbine rotors operating at 30 to 40 thousand rpm, over long periods of turbine operation. Guidelines for the arrangement of the thermocouple junctions are presented. Author

N75-16789*# Scientific Translation Service, Santa Barbara, Calif.
APPLICATION OF HIGH TEMPERATURE FILM THERMOCOUPLES IN THE STUDY OF THE TEMPERATURE FIELDS OF GAS TURBINE ENGINE ELEMENTS
L. S. Grigoryev and D. F. Simbirskiy Washington NASA Jan. 1975 7 p refs Transl. into ENGLISH from Tepl. Napryazh. Elementakh Konstrukt. (USSR), no. 14, 1974 p 137-139
(Contract NASw-2483)
(NASA-TT-F-16136) Avail: NTIS HC $3.25 CSCL 14B

Application of high temperature film thermocouples in the study of the temperature fields of gas turbine engine elements is studied. Author

N75-16790*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PRECISION COMPLIANCE TECHNIQUES FOR SLOW CRACK GROWTH MEASUREMENTS
Pascal J. Noronha 10 Jan. 1975 24 p refs
(NASA-TM-X-64904) Avail: NTIS HC $3.25 CSCL 14B

A method is presented for using simple electronic components to obtain the high sensitivity needed to measure very slow crack growth rates. The technique presented can reduce the experimental time considerably and also yield a greater amount of data more accurately than optical techniques for measuring crack growth rates. Author

N75-16791*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SCATTERING INDEPENDENT DETERMINATION OF ABSORPTION AND EMISSION COEFFICIENTS AND RADIATIVE EQUILIBRIUM STATE Patent Application
Alain L. Fymat, inventor (to NASA) (JPL) Filed 29 Jan. 1975 24 p
(Contract NAS7-100)
(NASA-Case-NPO-13677-1; NASA-Case-NPO-13678-1; US-Patent-Appl-SN-545285) Avail: NTIS HC $3.25 CSCL 14B

Techniques are described for determining at continuum or spectral line frequencies the true absorption (or emission) coefficients of a medium that simultaneously absorbs (or emits) and scatters incident radiation, and for studying the radiative equilibrium state. The technique measures the variations of net planar flux between pairs of planes spaced apart along each axis of inhomogeneity of the medium. The divergence of flux is determined as the sum of the variations divided by the distance. One plane of each pair is selected to be at the point of interest and, at that point, spherical flux and temperature are measured. Planck's function is evaluated from the temperature measurement, and the true absorption coefficient is determined from a divergence-flux relationship independent of scattering and polarization, and without the wavelength limitation. The true emission coefficient is also determined along with the state of radiative equilibrium. NASA

N75-16792*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC CHARACTER SKEW AND SPACING CHECKING NETWORK Patent Application
Robert T. McKenna, inventor (to NASA) Filed 6 Jan. 1975 25 p
(NASA-Case-GSC-11925-1; US-Patent-Appl-SN-538983) Avail: NTIS HC $3.25 CSCL 14B

A network is described for automatically checking the skew and character spacing of digital tape drive systems to indicate out-of-tolerance conditions of those parameters. The network enables a tape drive to check its own recording accuracy as well as that of tapes recorded on other drives. In operation, the first detected pulse of each character triggers a monostable multi-vibrator which locks out further data pulses and initiates a window pulse equal in length to the maximum permissible skew. At the end of the window pulse, data pulses may again be received. If a pulse is received after termination of the window pulse, the skew is determined to exceed specifications and a skew error indication is given by the illumination of a display light. A similar circuit arrangement is provided for detecting character spacing which is less than the minimum required for unambiguous data reproduction. NASA

N75-16793*# Technicolor Graphic Services, Inc., Houston, Tex.
FEASIBILITY OF CONVERTING HI-SPEED PROCESSOR FOR PROCESSING KODAK FILM TYPES 7381/7271 (16mm) AND 5381/5271 (35mm) USING KODAK ECP CHEMISTRY
Mark S. Weinstein Jul. 1974 21 p
(Contract NAS9-11500)
(NASA-CR-141603; TN-74-4) Avail: NTIS HC $3.25 CSCL 14E

Testing conducted to determine the feasibility of converting the 16/35/70 hi-speed processor to process Kodak film types 7381/7271 (16mm) and 5381/5271 (35mm) color negative films using Kodak ECP chemistry is described. Author

N75-16794*# Technicolor Graphic Services, Inc., Houston, Tex.
EVALUATION OF ANOMALIES OBSERVED ON FILM FROM S-190A FLIGHT SYSTEM CALIBRATION TEST
Paul F. Bourque, Lincoln Perry, and Gerard E. Sauer Jan. 1975 18 p
(Contract NAS9-11500)
(NASA-CR-141604; TR-73-1) Avail: NTIS HC $3.25 CSCL 14E

Due to a persistent problem of scratched film from testing of the Skylab S-190A system, a series of tests were designed to identify the cause of the film scratching. The procedures followed in this test for pretest handling and packaging of the film, the makeup of the rolls for processing, and the results of the processed film evaluation are reported. Author

N75-16795*# Technicolor Graphic Services, Inc., Houston, Tex.
SKYLAB 1 (1/2) SENSITOMETRIC SUMMARY
Mark S. Weinstein Sep. 1973 75 p
(Contract NAS9-11500)
(NASA-CR-141605; TR-73-3) Avail: NTIS HC $4.25 CSCL 14E

Sensitometric data obtained from all rolls of Skylab 1 original film containing sensitometric exposures applied by the Photographic Technology Division are presented. A summary is provided that identifies the supply and take-up magazine numbers, the amount of radiation, and the change in Dmax or Base + Fog due to heat and radiation for each roll of original film. Author

N75-16796*# Technicolor, Inc., Houston, Tex.
EFFECTS OF PROCESSING VARIABLES ON THE SENSITOMETRIC PROPERTIES OF EASTMAN KODAK FILM TYPE 2445
Mark S. Weinstein Nov. 1972 96 p
(Contract NAS9-11500)
(NASA-CR-141586; TR-72-11) Avail: NTIS HC $4.75 CSCL 14E

The sensitometric characteristics of Kodak color negative film Type 2445 with processing in a 1411 versamat with Kodak aero-neg. color process chemicals are described. These characteristics were determined for various combinations of machine speed, prehardener temperature, and first developer temperature. Author

N75-16797# Joint Publications Research Service, Arlington, Va.
METHODS AND EQUIPMENT USED IN HYDROPHYSICAL INVESTIGATION OF OCEAN TURBULENCE AND RADIOACTIVITY
30 Dec. 1974 22 p refs Transl. into ENGLISH from Morskiye Gidrofizicheskiye Issled. (Sevastopol), v. 50, no. 4, 1970 p 176-192, 204-207
(JPRS-63757) Avail: NTIS HC $3.25

The report contains a discussion of the problem involving the possibility of measuring the parameters of locally isotropic turbulence in the atmosphere and ocean with the aid of optical methods. Also, a description of a scintillation detector for measuring sea water radioactivity is presented. For individual titles, see N75-16798 through N75-16799.

N75-16798 Joint Publications Research Service, Arlington, Va.
APPLICATION OF OPTICAL TECHNIQUES FOR STUDY OF SMALL-SCALE TURBULENCE
G. G. Neuymin and V. N. Stasenko *In its* Methods and Equipment used in Hydrophys. Invest. of Ocean Turbulence and Radioactivity (JPRS-63757) 30 Dec. 1974 p 1-14 refs Transl. into ENGLISH from Morskiye Gidrofizicheskiye Issled. (Sevastopol), v. 50, no. 4, 1970 p 176-192 (For availability see N75-16797 08-35)

The problem involving the possibility of measuring the parameters of locally isotropic turbulence in the atmosphere and ocean is discussed with the aid of optical methods permitting the recording of fluctuations in the amplitude and phase of a plane light wave, propagating in a turbulent medium. Attention is given to the general questions of a link between a medium's turbulence and optical properties and the specific optical methods which can be utilized for collecting data on a medium's turbulent characteristics. Author

N75-16799 Joint Publications Research Service, Arlington, Va.
SCINTILLATION DETECTOR FOR MEASURING SEA WATER RADIOACTIVITY
A. V. Kasyanov, A. D. Zemlyanoy, and V. A. Klimenko *In its* Methods and Equipment Used in Hydrophys. Invest. of Ocean Turbulence and Radioactivity (JPRS-63757) 30 Dec. 1974 p 15-18 refs Transl. into ENGLISH from Morskiye Gidrofizicheskiye Issled. (Sevastopol), v. 50, no. 4, 1970 p 204-207 (For availability see N75-16797 08-35)

Conditions of the selection of optimal dimensions of plastic scintillators during measurements of low activity sources are discussed. Author

N75-16800*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EVALUATION OF IMAGE QUALITY IN A CASSEGRAIN-TYPE TELESCOPE WITH AN OSCILLATING SECONDARY MIRROR
E. F. Erickson and S. Matthews Washington Feb. 1975 26 p (NASA-TM-X-3137; A-5657) Avail: NTIS HC $3.75 CSCL 20F

A ray-trace analysis is described of aberrations and extreme rays of a Cassegrain-type telescope with a tilted secondary mirror. The work was motivated by the need to understand the factors limiting image quality and to assist in the design of secondary mirrors for three telescopes with oscillating secondary mirrors (OSM) used at Ames Research Center for high altitude infrared astronomy. The telescopes are a 31-cm-diameter Dall-Kirkham (elliptical primary, spherical secondary) flown aboard a Lear jet, a 71-cm balloon-borne Dall-Kirkham flown on the AIROscope gondola, and a 91-cm true Cassegrain (parabolic primary, hyperbolic secondary) flown aboard a C-141 jet transport. The optics for these telescopes were not designed specifically for OSM operation, but all have OSM's and all must be used with various detector configurations; therefore, a facility that evaluates the performance of a telescope for a given configuration is useful. The analytical expressions are summarized and results for the above systems are discussed. Details of the calculation and a discussion of the computer program are given in the appendices. Author

N75-16801*# Technicolor Graphic Services, Inc., Houston, Tex.
CIBACHROME TESTING
Mark S. Weinstein Dec. 1974 56 p ref
(Contract NAS9-11500)
(NASA-CR-141629; JSC-09360) Avail: NTIS HC $4.25 CSCL 14E

The use of Cibachrome products as a solution to problems encountered when contact printing Kodak film type SO-397 onto Kodak Ektrachrome color reversal paper type 1993 is investigated. A roll of aerial imagery consisting of Kodak film types SO-397 and 2443 was contact printed onto Cibachrome and Kodak materials and compared in terms of color quality, resolution, cost, and compatibility with existing equipment and techniques. Objective measurements are given in terms of resolution and sensitometric response. Comparison prints and transparencies were viewed and ranked according to overall quality and aesthetic appeal. It is recommended that Cibachrome Print material be used in place of Kodak Ektachrome paper because it is more easily processed, the cost is equivalent, and it provides improved resolution, color quality, and image fade resistance. J.M.S.

N75-16802# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THEORY AND DESIGN OF A CONSTANT TEMPERATURE LINEARIZED HOT WIRE ANEMOMETER
D. Olivari and R. Borres Oct. 1974 72 p refs
(VKI-TM-24) Avail: NTIS HC $4.25

A hot wire anemometer is defined as a small electrically heated element exposed to a fluid medium for the purpose of measuring a property of that medium, such as its velocity. The elements which constitute a hot wire anemometer system, i.e., the probe, the control circuit, the linearizer, are analyzed. Their characteristic parameters, and their relative importance to reach the final result of turbulent velocity measurements are discussed. Author

N75-16803# Joint Publications Research Service, Arlington, Va.
NAVIGATION INSTRUMENTS
8 Jan. 1975 22 p refs Transl. into ENGLISH from Izv. VUZ, Priborostr. (Leningrad), no. 8, 1974 p 64-76
(JPRS-63824) Avail: NTIS HC $3.25

The following reports are presented: an analysis of the systematic errors in pendulums in dependence on the damping factor in the cases of irregular and regular triaxial rolling of an object; a study of the properties of convergence of a multidimensional evaluation algorithm; and an analysis of changes in capacitance of an electrode-rotor system in an electrostatic suspension when the configuration of the rotor differs from a sphere. For individual titles, see N75-16804 through N75-16806.

N75-16804 Joint Publications Research Service, Arlington, Va.
SYSTEMATIC ERRORS OF DAMPED PENDULUMS UNDER CONDITIONS OF TRIAXIAL ROLLING OF AN OBJECT
V. S. Yevgenyev *In its* Navigation Instr. (JPRS-63824) 8 Jan. 1975 p 1-6 refs Transl. into ENGLISH from Izv. VUZ, Priborostr. (Leningrad), no. 8, 1974 p 64-67 (For availability see N75-16803 08-35)

This paper gives an analysis of the systematic errors in pendulums (instruments for measuring side-to-side and fore-to-aft listing) in dependence on the damping factor in the cases of irregular and regular triaxial rolling of an object. The conditions under which the considered errors become equal to zero were determined. Author

N75-16805 Joint Publications Research Service, Arlington, Va.
DEVICES FOR EVALUATING SIGNALS FOR NAVIGATION SYSTEMS
I. V. Semushin and V. N. Negoda *In its* Navigation Instr. (JPRS-63824) 8 Jan. 1975 p 7-11 refs Transl. into ENGLISH from Izv. VUZ, Priborostr. (Leningrad), no. 8, 1974 p 68-71 (For availability see N75-16803 08-35)

The convergence properties of a multidimensional evaluation algorithm were studied. The results of modeling simple, and optimum algorithms are presented along with an evaluation of model applications. Author

N75-16806 Joint Publications Research Service, Arlington, Va.
COMPUTING THE CAPACITANCE OF AN ELECTRODE-DEFORMED ROTOR SYSTEM

Yu. M. Osipov, Ye. M. Pevzner, and A. N. Balyasnikova *In its* Navigation Instr. (JPRS-63824) 8 Jan. 1975 p 12-18 refs Transl. into ENGLISH from Izv. VUZ, Priborostr. (Leningrad), no. 8, 1974 p 71-76 (For availability see N75-16803 08-35)

Changes in capacitance of an electrode-rotor system are analyzed in an electrostatic suspension when the configuration of the rotor differs from a sphere. Author

N75-16807*# National Aeronautics and Space Administration. Pasadena Office, Calif.

WIND SENSOR Patent Application

James B. Stephens (JPL) and Eric G. Laue, inventors (to NASA) (JPL) Filed 29 Jan. 1975 21 p

(Contract NAS7-100)

(NASA-Case-NPO-13462-1; US-Patent-Appl-SN-545282) Avail: NTIS HC $3.25 CSCL 14B

This device for sensing the temperature, velocity, and direction of the wind, includes four temperature-dependent crystal oscillators spaced about an axis, a heater centered on the axis, and a screen through which the wind blows to pass over the crystals. In one method of operation, the frequency of the oscillators is taken when the heater is not energized, to obtain the temperature of the wind, and the frequencies of the oscillators are taken after the heater is energized to determine the direction and velocity of the wind. When the heater is energized, the wind causes the downwind crystals to achieve a higher temperature than the upwind crystals, and with the magnitude of the difference indicating the velocity of the wind. NASA

N75-16808*# Athens Coll., Ala.

OPTICAL GRATING ANALYZER STUDIES Final Report

Joseph K. McDonald 9 Dec. 1974 9 p refs

(Contract NAS8-30813)

(NASA-CR-120809) Avail: NTIS HC $3.25 CSCL 14B

A spectrometer was specifically designed and developed to observe grating spectra over a range of incidence angles from normal to almost grazing incidence. A unique scanning and focusing mechanism is utilized to keep the exit slit on the Rowland circle. Polarization effects in the vacuum were investigated, and efficiency measurements and spectral scans were made simultaneously with the spectrometer. Results of measurements are given. Applications of the spectrometer to the space program and to the study of contamination on optical surfaces are indicated. J.M.S.

N75-16809*# Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.

SEOS FRAME CAMERA APPLICATIONS STUDY Final Report

14 Nov. 1974 138 p

(Contract NAS5-21989)

(NASA-CR-143683; AED-R-4045) Avail: NTIS HC $5.75 CSCL 14E

A research and development satellite is discussed which will provide opportunities for observation of transient phenomena that fall within the fixed viewing circle of the spacecraft. The evaluation of possible applications for frame cameras, for SEOS, are studied. The computed lens characteristics for each camera are listed. M.C.F.

N75-16810# Sandia Labs., Albuquerque, N.Mex.

BLAST PRESSURE TRANSDUCER AT SANDIA LABORATORIES

W. B. Leisher 1974 11 p refs Presented at 4th Intern. Symp. on Mil. Appl. of Blast Simulators, Berkshire, England, 9 Sep. 1974 Sponsored by AEC

(SLA-73-7034; Conf-740931-2) Avail: NTIS HC $3.25

Blast pressure measurements and some solutions involving flush diaphragm transducers, both piezoelectric and piezoresistive (strain), are presented. Blast pressure measurements are affected by transducer frequency response, resonance, acceleration (shock) sensitivity, and thermal zero shift caused by shock heating. Acceleration sensitivity and ruggedness are important when transducers are mounted on freely responding test pieces receiving several thousand g's. Piezoelectric transducers have high resonant frequencies and good frequency response but are subject to zero shifts due to heating and acceleration. Coaxial cables used with these transducers can cause spurious signals if moved during the data period; these signals can be eliminated by using line driver amplifiers. Piezoresistive transducers are usually less shock sensitive than piezoelectric transducers but are more deficient in other areas, especially in frequency response. NSA

N75-16811# Dow Chemical Co., Golden, Colo. Rocky Flats Div.

SINGLE CHANNEL PULSE-HEIGHT ANALYZER WITH READOUT

B. E. Martin 22 Aug. 1974 16 p

(Contract AT(29-1)-1106)

(RFP-2304) Avail: NTIS HC $3.25

The single channel pulse-height analyzer described is housed in a one-wide Nuclear Instrumentation Bin (NIM-BIN) module. The design uses the latest COS/MOS (complementary symmetry metal-oxide semiconductor) integrated circuits (IC) featuring low power, low cost, and high reliability. The module was developed specifically for isotopic identity in radiation detection systems. Author (NSA)

N75-16812# Sandia Labs., Albuquerque, N.Mex.

PINHOLE CAMERA FOR PHOTOGRAPHING X-RAYS FROM LASER-PRODUCED PLASMAS

J. J. Hohlfelder and M. A. Palmer 1974 10 p refs Presented at the 23d Ann. Conf. on Appl. of X-ray Analysis, Denver, 7 Aug. 1974 Sponsored by AEC

(SLA-74-5270; Conf-740809-4) Avail: NTIS HC $3.25

A pinhole camera was used to record low-energy X-rays produced from CD sub 2 microsphere irradiation with Sandia Laboratories' fourbeam, pulsed laser system. Camera useful energy rah-ge, spatial resolution, and X-ray energy sensitivity are discussed. Camera X-ray energy sensitivity which was determined by laboratory calibration is compared with measurements obtained with a multichannel X-ray spectrometer. X-ray photographs of laser-irradiated microspheres are presented. Spatial information about the X-ray source derived from these photographs is discussed. Author (NSA)

N75-16813# Ioannina Univ., (Greece).

ON-LINE STABILITY MONITOR FOR MOESSBAUER SPECTROMETERS Dept. of Physics.

N. H. J. Gangas and L. A. A. Prelorendjo [1974] 11 p

(NP-20073) Avail: AEC Depository Libraries HC $4.00

The principle of operation and the practical features of a simple electronic circuit which permits the on-line monitoring of the performance of Moessbauer spectrometers during the time of measurements are described. The circuit produces in the Moessbauer spectrum two dummy resonance lines, whose positions and widths reveal to the experimenter the overall performance of his spectrometer. For a constant acceleration spectrometer the sensitivity of the circuit is such that a 1% variation of the calibration of the spectrometer produces a visually detectable change in the position of a dummy line. Author (NSA)

N75-16814# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).

DEVELOPMENT OF MULTICHROMATIC HOLOGRAPHIC INTERFEROMETRY IN THE 3 MUm RANGE (HF LASER) AND APPLICATION TO HIGH-BETA STELLARATOR PLASMAS

W. Braun Jul. 1974 44 p refs In GERMAN

(IPP-1/146) Avail: AEC Depository Libraries HC $5.25

Holographic interferometry in the 3 micrometer wavelength range was developed to measure density profiles in toroidal high-beta plasmas. The choice of hydrogen fluoride (HF) laser (2.7....3.1 micrometer) as a light source meets exactly the requirement of optimal sensitivity of this method within the transparent region of quartz, of which discharge tubes are usually made. Eight strong spectral lines of the HF laser can be used to produce eight superposed holograms on a gelatin detector with almost linear sensitivity by a special method. The method was first applied to investigate the density distribution in a high-beta stellarator plasma. An elliptic deformation of the plasma cross section was observed. Author (NSA)

N75-16815# United Kingdom Atomic Energy Authority, Culham (England).

ABSOLUTELY CALIBRATED X-RAY IMAGE INTENSIFIER AND HIGH-SPEED SHUTTER BASED ON A CHANNEL MULTIPLIER ARRAY FOR THE DETECTION OF RADIATION FROM HIGH-DENSITY PLASMAS

M. G. Hobby, J. P. Rager, and N. J. Peacock May 1974 11 p refs

(CLM-R-138) Avail: AEC Depository Libraries HC $4.00; UK 50p

An X-ray image intensifier based on a channel multiplier array was developed to overcome the low overall sensitivity of wavelength dispersive crystal spectrometers. A prototype instrument was absolutely calibrated on standard X-ray sources and tested on two high-density plasmas. In addition to demonstrating a sensitivity gain of the order of 100 without appreciable loss of resolution, the intensifier was successfully shuttered for times as short as 12 nanoseconds by pulsing the accelerating voltage on to the channel plate. Author (NSA)

N75-16816# Commissariat a l'Energie Atomique, Grenoble (France). Laboratoire d'Applications Speciales de la Physique.

EXPERIMENTAL STUDY OF AN ALUMINIUM OXIDE HYGROMETER UTILIZATION OF A BALLOON-BORNE SYSTEM FOR STRATOSPHERIC SOUNDING

G. Pleyber Sep. 1974 83 p refs In FRENCH

(CEA-R-4612) Avail: AEC Depository Libraries HC $7.25

A balloon-borne system for determining stratospheric water vapor content through the use of a variable impedance technique is described. An account is given of the construction, properties, and calibration of the hygrometer based on the adsorption mechanism of water vapor in an anodized aluminum film. Low-temperature calibration (below 0 C) is difficult. Improvements are suggested that would make use of the sensor in the usual practice. Author (NSA)

N75-16817# Mound Lab., Miamisburg, Ohio.

AUTOMATED THETA-THETA DIFFRACTOMETER AND SAMPLE CONTAINMENT SYSTEM FOR THE INVESTIGATION OF LIQUIDS AND SOLIDS AT HIGH TEMPERATURES

C. R. Hudgens 1974 14 p refs Presented at Am. Crystallographic Assoc., Univ. Park, Pa., 19 Aug. 1974

(Contract AT(33-1)-GEN-53)

(MLM-2173(OP); Conf-740838-1) Avail: NTIS HC $3.25

A theta-theta diffractometer (Picker) was modified for computer control by the installation of a stepping motor and an absolute encoder on the two-theta drive shaft. The detection system consists of a balanced filter, scintillation counter, and conventional PHA electronics inputting into computer-compatible high-speed scalers. The sample support is a hollow, refractory metal post, heated from within by an electron beam concentrated under the sample. The sample is protected by a controllable-composition, low-pressure atmosphere in a chamber completely isolated from that of the electron beam heater. For studies on highly active metals, atmospheres of helium or argon are used. A specially designed mercury vapor pump, conventionally trapped, is used as a positive pressure pump for recirculation of the gas. Reducing conditions may be provided by controlled addition of hydrogen to the atmosphere through a palladium diffuser. The system was designed for the determination of the liquid structures of the transuranium elements. Author (NSA)

N75-16818# Sandia Labs., Albuquerque, N.Mex.

FLIGHT MASS SPECTROMETRY AT SANDIA LABORATORIES

R. O. Woods Oct. 1974 28 p refs

(Contract AT(29-1)-789)

(SAND-74-0175) Avail: NTIS HC $3.75

Sandia Laboratories has an extensive background in the adaptation of mass spectrometers to unusual environments. The purpose of this report is to document that capability and to define it for other possible users. Author (NSA)

N75-16819# Sandia Labs., Albuquerque, N.Mex.

SOME APPLICATIONS OF COMPUTERIZED ULTRASONIC DATA ACQUISITION AND DISPLAY SYSTEM

J. H. Gieske 1974 23 p Presented at Automated Inspection and Product Control Conf., Chicago, 15 Oct. 1974 Sponsored by AEC

(SAND-74-5401; Conf-741020-1) Avail: NTIS HC $3.25

A minicomputer data acquisition and display system is described along with a description of an ultrasonic data acquisition computer interface. Fourteen examples of computerized ultrasonic data displays are presented. Author (NSA)

N75-16820# Ames Lab., Iowa.

QUADRUPOLE MASS SPECTROMETER FOR THE IDENTIFICATION AND CHARACTERIZATION OF NEUTRAL FRAGMENTS FORMED BY THE INTERACTION OF GASEOUS MOLECULES WITH ELECTRONS Ph.D. Thesis - Iowa State Univ.

J. R. Reecher Oct. 1974 182 p refs

(IS-T-643) Avail: NTIS HC $7.00

A quadrupole mass spectrometer with a modified ion source and modified ion detection circuitry for identifying and characterizing neutral fragments formed by the interaction of electrons with gaseous molecules is described. The instrument incorporates the capability of automatic scanning and recording of neutral fragment mass spectra and neutral fragment ionization potential and appearance potential curves. The neutral fragment mass spectra were measured and compared with their corresponding positive ion mass spectra. Numerous neutral fragment ionization potentials were also measured and compared with available literature values. In addition, the neutral fragment ionization potentials, for which no literature values were available, were measured and reported. Author (NSA)

N75-16821# California Univ., Livermore. Lawrence Livermore Lab.

MAGNETIC PROBES AS PARTICLE VELOCITY DETECTORS

B. Hayes 11 Sep. 1974 20 p refs

(Contract W-7405-eng-48)

(UCID-16584) Avail: NTIS HC $3.25

Two types of magnetic probes, the stirrup and axially-symmetric magnetic (ASM) probes, are examined for measuring particle velocity in detonation products. Although the stirrup probe is simple in operation and provides voltage data relatively easy to translate into velocity, it has serious electrical noise limitations. The ASM-probe is more complex and provides data more difficult to translate, but does not have the noise problems associated with the stirrup probe. It is indicated that the ASM-probe is the more effective detector of particle velocity. Author (NSA)

N75-16822# Bendix Corp., Kansas City, Mo.

MAXIMUM HUMIDITY INDICATOR Final Report

W. B. Abel Oct. 1974 20 p refs Revised

(Contract AT(29-1)-613)

(BDX-613-1150-Rev) Avail: NTIS HC $3.25

Moisture-sensitive systems to measure and indicate the maxium level of humidity exposure are discussed. A chemical indicator utilizing deliquescent salts had water-soluble dyes provides an irreversible color change at discrete levels of relative humidity. To provide indication of the time at which the exposure occurs, a circuit employing a resistive-type sensor was developed. A small, commercially available sensor is used in a portable probe to detect humidity leaks into controlled areas. Author (NSA)

N75-16823# Southampton Univ. (England). Inst. of Sound and Vibration Research.

THE ISVR CONSTANT TEMPERATURE HOT WIRE ANEMOMETER

P. O. A. L. Davies and J. Mason Feb. 1974 33 p refs

(ISVR-TR-66) Avail: NTIS HC $3.75

The principles of hot wire anemometer operation are summarized. The design, specifications, and applications for the constant temperature hot wire and hot film anemometer system are discussed. Information is provided on probe construction with selected references giving general information on flow measurement and signal interpretation. Author (ESRO)

N75-16824# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.

OPTICAL SYSTEM OF A BALLOON TELESCOPE FOR HIGH RESOLUTION FOURIER SPECTROSCOPY IN THE INFRARED [DAS OPTISCHE SYSTEM EINES BAL-

LONTELESKOPS FUER HOCHAUFLOESENDE FOURIER SPEKTROSKOPIE IM INFRAROTEN SPEKTRALBEREICH]
Reiner Hofmann Sep. 1974 166 p refs In GERMAN
(MPI-PAE/Extraterr-103) Avail: NTIS HC $6.25

Design considerations for a high resolution spectrophotometer for use in a balloon telescope are given. The theoretical basis of Fourier spectroscopy is presented, and the lamellar grid and Michelson interferometer are compared. The optical equipment is detailed and experimental results discussed. ESRO

N75-16825# Technisch Physisch Dienst TNO-TH, Delft (Netherlands).
A 1m-UV TELESCOPE: MISSION DEFINITION STUDY
A. Hammerschlag (Inst. of Appl. Phys., Delft), C. Jamar (Inst. d'Astrophys., Liege), D. Malaise (Inst. d'Astrophys., Leige), K. A. Vanderhucht (Space Res. Lab., Utrecht), T. Kampermann (Space Res. Lab., Utrecht), H. Bokhove (Inst. of Appl. Phys., Delft), and C. Smorenburg (Inst. of Appl. Phys., Delft) 15 Oct. 1974 220 p refs
(Contract ESRO-SC/40-HQ)
(Rept-411.332; ESRO-CR(P)-563) Avail: NTIS HC $7.25

Technical concepts, development programs and cost estimates are elaborated for an UV telescope facility in Spacelab. The imaging-spectroscopy-photometry telescope, having a 1 m diameter mirror, though primarily intended for high resolution spectroscopy in the ultraviolet, will also be suitable for other techniques. Different observing instruments can be mounted on it and flown simultaneously. The telescope will be mounted on a three axis stabilized platform. ESRO

N75-16826# TRW Systems, Redondo Beach, Calif.
APPLICATION OF HOLOGRAPHIC METHODS TO THE MEASUREMENT OF FLAMES AND PARTICULATE, VOLUME 2 Final Report
B. J. Matthews and C. N. Lear Apr. 1974 122 p refs
(PB-235675/6; TRW-23523-6001-TU-00-Vol-2; EPA-650/2-74-031-b-Vol-2) Avail: NTIS HC $5.25 CSCL 14E

The report gives results of an investigation to determine the feasibility of applying pulsed ruby laser holographic techniques to the measurement of particulate in the 1-micrometer and submicrometer size range. The investigation included the design and evaluation of a scattered light holocamera, and evaluation of the effects of four basic variables on scattered light methods. The variables were: particle size, angular illumination of the particle (scattering angle), particle number density, and incident laser beam kiameter. The program included an analysis of the mathematical and physical models from which the transformation can be made from a scattered light distribution to a particle size distribution. The experimental portion of the program was conducted to assess the advantages and limitations of certain promising scattered light holographic methods. (Modified author abstract) GRA

N75-17205* Boeing Co., Wichita, Kans.
AUTOMATED ANALYSIS OF VIDEO DATA
Donald J. Hafner *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 181-188 (For availability see N75-17188 08-80)
CSCL 09D

N75-17248* Colorado Univ., Boulder.
THE MARINER JUPITER/SATURN PHOTOPOLARIMETER EXPERIMENT
Charles F. Lillie *In* NASA, Washington The Rings of Saturn 1974 p 131-139 ref (For availability see N75-17236 08-88)
CSCL 14B

N75-17249* New Mexico Univ., Albuquerque.
THE MARINER JUPITER/SATURN VISUAL IMAGING SYSTEM
Bradford A. Smith *In* NASA, Washington The Rings of Saturn 1974 p 141-143 (For availability see N75-17236 08-88)
CSCL 14E

N75-17250* Kitt Peak National Observatory, Tucson, Ariz.
THE MARINER JUPITER/SATURN ULTRAVIOLET EXPERIMENT
A. Lyle Broadfoot *In* NASA, Washington The Rings of Saturn 1974 p 145-146 (For availability see N75-17236 08-88)
CSCL 14B

N75-17251* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE MARINER JUPITER/SATURN IRIS EXPERIMENT
Thomas E. Burke *In* NASA, Washington The Rings of Saturn 1974 p 147-153 (For availability see N75-17236 08-88)
CSCL 14B

N75-17253* General Electric Co., Philadelphia, Pa.
THE SISYPHUS PARTICLE DETECTOR
Robert K. Soberman *In* NASA, Washington The Rings of Saturn 1974 p 167-173 (For availability see N75-17236 08-88)
CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-16827*# National Aeronautics and Space Administration. Pasadena Office, Calif.
REFLECTED WAVE MASER Patent Application
Robert C. Clauss, inventor (to NASA) (JPL) Filed 12 Feb. 1975 23 p
(Contract NAS7-100)
(NASA-Case-NPO-13490-1; US-Patent-Appl-SN-549418) Avail: NTIS HC $3.25 CSCL 20E

The design and operation of a two-direction reflected-wave maser that exhibits a net gain characteristic that is equivalent to a prior art traveling-wave maser of more than twice the length is described. By cascading stages and immersing the slow-wave structures in a nonuniform magnetic field, a reflected-wave maser amplifier that has exceptionally wide bandwidth while maintaining a gain comparable to prior art traveling wave maser amplifiers is realized. NASA

N75-16828# Advisory Group for Aerospace Research and Development, Paris (France).
EVALUATION OF THE POTENTIAL BENEFIT TO THE AERONAUTICAL FIELD FROM LASER TECHNOLOGY
Dec. 1974 251 p refs Partly in ENGLISH; partly in FRENCH
(AGARD-AG-195; AGARDograph-195) Avail: NTIS HC $8.50

The characteristic properties of lasers are reported and their applications to aeronautical engineering are discussed. For individual titles, see N75-16829 through N75-16843.

N75-16829 Royal Radar Establishment, Malvern (England).
REVIEW OF CHARACTERISTIC LASER PROPERTIES
M. J. Taylor *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 24 p refs (For availability see N75-16828 08-36)

Lasers can be made from solid, gaseous or liquid materials, and the emission may be either continuous wave (CW) or pulsed, depending on the system. The range of CW power in laser beams varies from milliwatts to kilowatts and pulsed systems give peak powers of up to terrawatts with pulse widths in the picosecond range. The energy in such short, intense pulses may not, however, be very high. The principles and properties of lasers are summarized, emphasizing aspects which are particularly relevant to avionic systems design. Author

N75-16830 Service Technique des Telecommunications de l'Air, Paris (France).
POSSIBLE APPLICATION OF LASERS IN AERONAUTICS [DOMAINES POSSIBLES D'APPLICATION DES LASERS EN AERONAUTIQUE]
Jean Bertrais *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 5 p In FRENCH (For availability see N75-16828 08-36)

Laser use in aeronautics covering data transmission support, analysis of structures, tests of aircraft equipment, and as a source of light in holographic procedures is reported. Image storage trajectory determinations, and reconnaissance missions are also discussed. Transl. by E.H.W.

N75-16831* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OPTICAL COMMUNICATION IN FREE SPACE
Henry H. Plotkin, Nelson McAvoy, and Michael W. Fitzmaurice *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 24 p refs (For availability see N75-16828 08-36)

Two classes of laser communication systems for handling very high data rates across inter-satellite distances are considered that provide for high antenna gains, wide modulation bandwidths, and optical receiver sensitivities. System design considerations are based upon the carbon dioxide laser modulation to accommodate digital or analog information, and the neodymium doped YAG laser pulse for digital modulation. G.G.

N75-16832 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
AIRBORNE INSTRUMENTATION ALTIMETERS, DOPPLER-NAVIGATORS, VELOCIMETER, CAT-DETECTION
F. Malota *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 12 p refs (For availability see N75-16828 08-36)

The possible uses of lasers in airplanes as altimeters, velocimeters, for Doppler navigation and for clear air turbulence detection are discussed. It is shown that the shorter wavelengths of lasers have some advantages over microwaves and radiowaves in avionics applications. G.G.

N75-16833 Army Electronics Command, Fort Monmouth, N.J.
THE APPLICATION OF LASERS TO THE PROBLEMS OF VERY LOW LEVEL FLIGHT OBSTACLE AVOIDANCE AND TERRAIN FOLLOWING
C. M. Kellington *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 9 p refs (For availability see N75-16828 08-36)

Lasers have found application in helping to solve the problems of very low level flight by U.S. Army aircraft. In the following is discussed: the reasons why Army aircraft fly low, the nature of the operational problems encountered at low altitudes, the technical problems associated with the design of systems to enhance low level flight capability, research efforts to date directed toward solution of the problem of low level flight and finally a comparison of the capabilities of microwave and laser systems in this area. The limitations of laser systems and research areas still requiring investigation are also discussed. Author

N75-16834 Lincoln Lab., Mass. Inst. of Tech., Lexington.
AIRBORNE SURVEILLANCE AND RECONNAISSANCE
R. H. Kingston *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 3 p Sponsored by Dept. of the Air Force (For availability see N75-16828 08-36)

The use of a laser for illumination offers many advantages over reconnaissance and surveillance using either standard photography or microwave radar. Foremost among these advantages are high resolution images not dependent upon daylight, much higher resolution than that obtainable with radar, and the possibility of range-gating for suppression of foreground backscatter as well as range determination. In this review of the use of lasers in airborne surveillance and reconnaissance, the detailed advantages of such systems, the types of systems and possible applications, and the problem areas requiring further research and development are discussed. Author

N75-16835 Royal Aircraft Establishment, Farnborough (England).
RANGING GUIDANCE AND DESIGNATION
A. R. Newbery and J. C. Mabberley *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 10 p refs (For availability see N75-16828 08-36)

The use of lasers for ranging, guidance and designation is reviewed and advantages and disadvantages over more conventional techniques are indicated. The discussion is mainly limited to systems employing basic components which are currently available. Possible future systems are mentioned, with some emphasis on the development trends expected. Author

N75-16836 Thomson-CSF, Issy les Moulineaux (France).
TRAJECTOGRAPHY: TRACKING [TRAJECTOGRAPHIE: POURSUITE]
H. Maillet (Labs. de Marcoussis), G. Couderc, P. Sergent, M. deNoray (Engins MATRA), and R. Moreau (ONERA) *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 38 p refs In FRENCH; ENGLISH summary (For availability see N75-16828 08-36)

Problems relating to the optical tracking of a target, either friend or foe are discussed. Generalities are given on methods used to solve these problems and the main types of lasers that were used. A survey was also made of the methods applicable to air target trajectography, including those parts of the trajectory that are in contact with the ground. Satellite trajectography from ground based stations and optical tracking in the instance of antiaircraft defense operations are included. Author

N75-16837 Compagnie Generale d'Electricite, Marcoussis (France). Div. des Applications Optiques.
HOLOGRAPHIC STORAGE OF OPTICAL IMAGES AND VISUALIZATION OF LASER SYSTEMS [STOCKAGE HOLOGRAPHIQUE DES IMAGES OPTIQUES ET SYSTEMES VISUALISATION A LASER]
G. Courrier *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 26 p refs In FRENCH; ENGLISH summary (For availability see N75-16828 08-36)

The state of the art in the fields of holographic storage and retrieval and large screen displays was examined. Particular attention was given to methods, as the Fourier transform holography and frequency carrier photography. Advantages of the methods using laser sources were reviewed along with main parameters influencing design concepts. Author

N75-16838 Physics Lab. RVO-TNO, The Hague (Netherlands).
OPTICAL CORRELATION
J. A. Boden *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 20 p refs (For availability see N75-16828 08-36)

A survey is given of the most common types of coherent optical correlators, which are classified as spatial plane correlators, frequency plane correlators and special reference correlators. Only the spatial plane correlators are dealt with rather thoroughly. Basic principles, some special features, advantages and disadvantages mostly are given with references to relevant literature. Optical processing of sideways looking synthetic aperture radar data and the acousto-optical processing of linear FM radar signals are described as special reference correlators, of which the first has become the most important application of optical data processing to date. Some advantages and disadvantages of incoherent correlators are given for comparison along with some examples of the most common types. A detailed description of a simple coherent spatial plane correlator is given. Some experimental results are mentioned. The reference function in this correlator is realized as a hard clipped phase plate, which results in a large detection region and a high signal output. Author

N75-16839 Army Electronics Command, Fort Monmouth, N.J.
THE LASER GYRO
Vernon Dickey *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 10 p refs (For availability see N75-16828 08-36)

A general discussion of laser gyro technology is presented which includes basic principles of operation and various effects which introduce errors. This is followed by a review of the engineering aspects of design and contruction. Finally, the potential capabilities and limitations as related to system applications are considered. Author

N75-16840 Office of Naval Research, Arlington, Va.
APPLICATIONS OF LASER OPTICS TO AERONAUTICAL ENGINEERING
Robert D. Matulka *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 23 p refs (For availability see N75-16828 08-36)

The use of lasers and laser optics is discussed for several fields of aeronautical engineering which include experimental fluid and structural mechanics and testing. The advantages of laser optics and the application to laser scattering, holography, and

photography are outlined. The application of holography to wind tunnel diagnostics is detailed as a tutorial example of applied laser optics. State of the art description is also attempted for the fields of non-destructive testing, vibration analysis, laser Raman spectroscopy, velocimetry, and photo-elasticity. Suggestions for potential applications are made when appropriate, throughout the paper. Author

N75-16841 Compagnie Generale d'Electricite, Marcoussis (France). Section Electronique et Photonique.
OPTICAL FIBER COMMUNICATION ONBOARD AIRCRAFT [COMMUNICATIONS PAR FIBRES OPTIQUES A BORD D'AVIONS]
J. Ernest *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 11 p refs In FRENCH; ENGLISH summary (For availability see N75-16828 08-36)

Recent advances in optical fiber transmission and their potential use in some specific areas are reported. These advances include: different types of low pass optical fibers, single mode cladded glass fibers, multimode cladded glass fibers, multimode cladded liquid core cladded fibers and SELFOC glass fibers. Important components of an optical fiber link, mostly light emitters, are examined along with tradeoffs and possible combinations of components for specific system applications. Advantages of optical fiber transmission are discussed with emphasis on features related specifically to communication link problems with an aircraft. Author

N75-16842 Service Technique des Telecommunications de l'Air, Paris (France).
CONCLUSIONS AND RECOMMENDATIONS [CONCLUSIONS ET RECOMMANDATIONS]
J. Bertrais *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 7 p In FRENCH (For availability see N75-16828 08-36)

Recommendations regarding the feasibility, use, and applications of various laser types and laser systems in aerospace are given. Special attention was given to tracking studies, communication, surveillance and reconnaissance onboard aircraft, and image storage techniques. Transl. by E.H.W.

N75-16843 Direction des Recherches et Moyens d'Essais, Paris (France).
ATMOSPHERIC LASER BEAM PROPAGATION
A. Laurens *In* AGARD Evaluation of the Potential Benefit to the Aeron. Field from Laser Technol. Dec. 1974 21 p refs In FRENCH; ENGLISH summary (For availability see N75-16828 08-36)

Laser beam propagation is modified by absorption, by scattering and by turbulence. Absorption in the atmosphere is brought about by molecular constituants. The absorption by scattering depends on Rayleigh scattering and Mie scattering; Rayleigh scattering can be neglected for wavelengths longer than 0,5 microns. Mie scattering is related to the dimensions of the particles; the attenuation of hazes and selective fogs decreases when the wavelength increases. The effects of turbulence on laser beam propagation are beam spreading, beam deviation, amplitude and phase variations whose consequences are scintillation and coherence losses; those effects are more important for short wavelengths than for long wavelengths. Author

N75-16844# Kozponti Fizikai Kutato Intezet, Budapest (Hungary).
DISTRIBUTED FEEDBACK X-RAY LASER ARRANGEMENT PROPOSAL IN PREPLASMA STATE
Gy. Farkas and Z. Gy. Horvath 1974 9 p refs
(KFKI-74-61) Avail: AEC Depository Libraries HC $4.00

The principle of distributed feedback (DFB) lasers is proposed in the X-ray wavelengths range using monocrystals, with convenient Laue-planes. Several crystals, fulfilling the DFB condition for their characteristic wavelength, are suggested. It was concluded from photoelectron emission experiments, that the X-ray laser process may take place before destroying the crystal structure. Author (NSA)

N75-16845# Institut Franco-Allemand de Recherches, St. Louis (France).
LASER ANEMOMETRY. IMPROVEMENT OF ACCURACY BY ELIMINATION OF ERRORS PRODUCED BY LARGE PARTICLES [ANEMOMETRIE LASER. AMELIORATION DE LA PRECISION DES MESURES PAR ELIMINATION DES ERREURS DUES A LA PRESENCE DE GROSSES PARTICULES]
J. Haertig and V. Fleck 15 Mar. 1974 57 p refs In FRENCH
(Contract DRME-74/272)
(ISL-10/74) Avail: NTIS HC $4.25

The accuracy of a laser anemometer was improved for flows with high velocity gradients. The instrument is based on a Doppler difference method, with which a velocity component can be measured at a point and the flow velocity is equated to the velocity of natural particles in the flow. The time difference for separate particles to tranverse the test volume was measured. The results lead to a statistical investigation of the level of photodetector signals. This analysis makes it possible to determine a relationship between the particle size and the signal amplitude, allowing for the particle size distribution. ESRO

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-16846 British Library Lending Div., Boston Spa (England).
DAMAGE TO TURBO-ALTERNATORS
H. Kugler 29 Oct. 1973 24 p refs Transl. into ENGLISH from Maschinenschaden (Munich), v. 45, no. 5, 1972 p 179-188
(BLL-CE-Trans-6229-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

By statistical evaluation of incidents of damage notified over the past three years, it is possible to ascertain certain focal points of damage. Examples of such focal points are in the case of the stator, the windings, where mechanical influences such as electric power and electrical insulation defects are the primary causes of damage; and in the case of the inductor, the exciter windings and conductors, where grounding and winding short circuiting occurs; and the area around the end ring and rotor end. Remedial measures are, where possible, indicated and unit risk exposures are considered. Author

N75-16847 British Library Lending Div., Boston Spa (England).
REQUIREMENTS AND ACCEPTANCE CRITERIA FOR HEAVY FORGINGS FOR TURBOGENERATOR MANUFACTURE
R. Schinn 29 Oct. 1973 34 p refs Transl. into ENGLISH from VGB Kraftwerktech. (West Ger.), v. 53, no. 3, Mar. 1973 p 182-195
(BLL-CE-Trans-6247-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Results of microfractographic investigations on the smaller forgings manufactured by conventional methods are compared with results for very large forgings produced by the 'after-pouring process'. The latter process produces less inhomogeneity and higher fracture resistance than conventional production. Author

N75-16848 British Library Lending Div., Boston Spa (England).
MAJOR DAMAGE TO STEAM TURBINES
H. Huppmann 4 Feb. 1974 21 p refs Transl. into ENGLISH from Maschinenschaden (West Ger.), v. 46, no. 1, 1973 p 1-8
(BLL-CE-Trans-6296-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

A survey is presented of major damage to maximum output steam turbines with the Federal Republic of Germany and also outside of it. It was found that costly failures and material damage in steam turbines can be avoided by an international exchange of damage experience, its causes, and measures for improvement. M.J.S.

N75-16849 Polish Academy of Sciences, Warsaw.
COMBINED VIBRATIONS OF A SYMMETRIC ROTOR [DRGANIA KOMBINOWANE SYMETRYCZNEGO WIRNIKA]
Agnieszka Muszynska 6 Dec. 1973 28 p refs In POLISH

(Rept-47/1973) Avail: Issuing Activity

The motion of a symmetrical, unbalanced rotor at two degrees of freedom is modeled in the form of a differential equation. Other topics discussed include Taylor series, nonlinear equations, rotor stability, synchronous whirling, and vibration measurement. Transl. by M.J.S.

N75-16850*# Martin Marietta Corp., Denver, Colo.
TRACK-TRAIN DYNAMIC ANALYSIS AND TEST PROGRAM, TRUCK STATIC TEST
Albert G. Nemes Nov. 1974 351 p
(Contract NAS8-29882)
(NASA-CR-120583; TR-74-131S) Avail: NTIS HC $10.00 CSCL 20K

A series of tests were conducted to define the characteristics of an ASF 11 Ride Truck Assembly including joint slop, friction and stiffness. Loading to the truck assembly included vertical load to simulate the car/pool loading combined with lateral or moment loading that resulted in desired truck deflections for the various phases of testing. All seven test conditions were successfully completed with load and deflection data being collected. No attempt is made to reduce the applicable data other than to provide computer plots. Author

N75-16851*# Scientific Translation Service, Santa Barbara, Calif.
ADVANCES IN ELECTRODEPOSITION
Hans Benninghoff Washington NASA Jan. 1975 28 p Transl. into ENGLISH from Galvanotechnik (West Germany), v. 60, no. 4, 1969 p 293-302
(Contract NASw-2483)
(NASA-TT-F-16134) Avail: NTIS HC $3.75 CSCL 13H

Experience with electroplating and current-less plating of various metals and alloys, including palladium, platinum, platinum/iridium, platinum/rhenium, rhenium/tungsten, rhodium, silver, vanadium, bismuth, tungsten/iron, zinc, tin, tin/nickel, tin/zinc, (by electroplating) and chromium, nickel, nickel/cobalt, cobalt, cobalt/tin, cobalt/zinc, cobalt/manganese, copper, silver and rhenium (electroless) is reviewed. Author

N75-16852*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A STEERING LAW FOR A ROOF-TYPE CONFIGURATION FOR A SINGLE-GIMBAL CONTROL MOMENT GYRO SYSTEM
Tsuneo Yoshikawa 12 Dec. 1974 56 p
(NASA-TM-X-64907) Avail: NTIS HC $4.25 CSCL 14B

Single-Gimbal Control Moment Gyro (SGCMG) systems have been investigated for attitude control of the Large Space Telescope (LST) and the High Energy Astronomy Observatory (HEAO). However, various proposed steering laws for the SGCMG systems thus far have some defects because of singular states of the system. In this report, a steering law for a roof-type SGCMG system is proposed which is based on a new momentum distribution scheme that makes all the singular states unstable. This momentum distribution scheme is formulated by a treatment of the system as a sampled-data system. From analytical considerations, it is shown that this steering law gives control performance which is satisfactory for practical applications. Results of the preliminary computer simulation entirely support this premise. Author

N75-16853*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
DESIGN CRITERIA FOR LOW PROFILE FLANGE CALCULATIONS Final Report
Karl R. Leimbach Mar. 1973 228 p refs
(Contract NAS8-28614)
(NASA-CR-120599; LMSC-HREC-TR-D306492) Avail: NTIS HC $7.50 CSCL 13E

An analytical method and a design procedure to develop flanged separable pipe connectors are discussed. A previously established algorithm is the basis for calculating low profile flanges. The characteristics and advantages of the low profile flange are analyzed. The use of aluminum, titanium, and plastics for flange materials is described. Mathematical models are developed to show the mechanical properties of various flange configurations. A computer program for determining the structural stability of the flanges is described. Author

N75-16854# Lockheed Missiles and Space Co., Palo Alto, Calif.
KINEMATICS OF A FREE PISTON EXPANDER
A. V. Martynovskii [1975] 5 p refs Transl. into ENGLISH from Kholod. Tekhn. i Tekhnol. (Kiev), no. 18, 1974 p 28-33
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A method of analyzing and optimizing a theoretical indicator diagram for a free-piston Longsworth expander is developed. The question of how to assure the selected form of the indicator diagram for a machine without having the kinematic coupling between the motion and gas distribution mechanisms is solved in a first approximation. It is assumed that the friction and inertia forces are negligible compared to the pressure forces. In this case the piston velocity and duration of each of the processes are determined just by the discharge through the choke hole and the valves. The analytical dependences connecting the instantaneous values of the discharges to the thermodynamic and structural characteristics of the expander permit computation of the valve cyclogram. Author

N75-16855*# Kanner (Leo) Associates, Redwood City, Calif.
THE THERMAL AND STRESSED STATES OF ROTORS OF CENTRIPETAL GAS TURBINES
Ya. M. Gusak, ye. P. Dyban, A. F. Kolesnichenko, S. A. Mokrushin, and M. V. Stradomskiy Washington NASA Feb. 1975 208 p refs Transl. into ENGLISH of the book "Teplovoye i Napryazhennoye Sostoyaniya Rotorov Radial' no-osevykh Gasovykh Turbin" Kiev, Naukova Dumka Press, 1973 p 1-184
(Contract NASw-2481)
(NASA-TT-F-16148) Avail: NTIS HC $7.25 CSCL 21E

Theoretical and experimental data on rotors of small turbines of the type used in superchargers of internal combustion engines are examined and generalized. Engineering methods of calculating the thermal and stressed states of rotors with different types of cooling are proposed. Author

N75-16856# Mitsubishi Heavy-Industries Ltd., Nagasaki (Japan).
A THERMO-ELASTIC ANALYSIS OF THE PARALLEL SURFACE THRUST BEARING
Susumu Taniguchi (Nagasaki Tech. Inst.) Dec. 1974 16 p refs
(MTB-95) Avail: NTIS HC $3.25

An optical interferometric technique was used to display the distorted film shape in a nominally parallel surface thrust bearing. The test bearings of different basic thickness were made of aluminum to accentuate thermal expansion and were lapped flat before use. A theoretical computer analysis was carried out to solve the Reynolds and energy equations together with the elasticity equation, which was derived from a modified two-dimensional finite element method. The experimental results were compared with tilting pad bearings performance and previously developed multiple regression equations. Author

N75-16857# Mitsubishi Heavy-Industries Ltd., Nagasaki (Japan).
APPLICATION OF WELD FORMING TECHNIQUE TO MANUFACTURING OF AUSTENITIC STAINLESS STEEL ELBOW FOR NUCLEAR POWER PLANT SERVICE
1974 20 p refs In JAPANESE; ENGLISH summary
(MTB-96) Avail: NTIS HC $3.25

The metallurgical and mechanical properties of welded joints made from austenitic stainless steels are discussed. The weld forming techniques are described. The application of the elbow welds to the main coolant pipes of a light water reactor of a nuclear power plant is explained. Diagrams of the welds and the welding techniques are provided. Author

N75-16858# Bendix Corp., Kansas City, Mo.
BRUSH DEBURRING OF MINIATURE PARTS Topical Report
L. K. Gillespie Oct. 1974 32 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1056-Rev) Avail: NTIS HC $3.75

Brush deburring can produce burr-free near-sharp edges on some miniature metal components. A maximum edge radius of 0.002 inch (50.8 microns) is possible; a more practical limit is 0.003 inch (76.2 microns) maximum. Radii with tolerances of 0.003 to 0.005 inch (76.2 to 127 microns) are not producible by brush deburring. Author (NSA)

N75-16859# Bendix Corp., Kansas City, Mo.
EFFECTS OF REAMING VARIABLES ON BURR PROPERTIES Topical Report
L. K. Gillespie Sep. 1974 33 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1083-Rev) Avail: NTIS HC $3.75

Component parts of small mechanisms have typically required near-sharp edges to assure reliable component operation: a burr-free condition is needed to minimize possible electrical and mechanical jamming of the mechanism if burrs should break loose during operation. In the past, reliable removal of machining burrs, combined with protection of the near-sharp edge requirements, has dictated that deburring be done only by hand, which is time consuming and inherently operator variable. The repeatability of burr removal and the time required for removal are directly related to burr size: small burrs are easily removed by many deburring processes. The investigation showed that the amount of stock removed by the reamer, and the reamer geometry, are the two most significant variables influencing burr size. Feedrate has little effect on burr length or thickness. Burrs in brass workpieces were found noticeably shorter than those in 303 Se stainless steel and aluminum, while stainless steel tended to have slightly thicker burrs than aluminum or brass.
Author (NSA)

N75-16860# Bendix Corp., Kansas City, Mo.
ALUMINUM ETCHANT STUDIES Topical Report
W. H. Knopf Sep. 1974 15 p ref Revised
(Contract AT(29-1)-613)
(BDX-613-1105-Rev) Avail: NTIS HC $3.25

Study of creating precision patterns in thin films involves etching 0.00045-inch-thick (11.43 micron) aluminum. Presently, the absolute measurements of etched element widths cannot be made to closer than + or - 0.0003 inch (7.62 micron) because the element edge is not a straight line. The measurement uncertainty is a result of the present etchant acting on the aluminum and creating a rough edge. An investigation was initiated to develop an etchant that would result in a smoother, more consistent edge. The approach taken to develop an improved etchant was to test as many different chemicals and chemical combinations as possible that have the ability to etch aluminum at a reasonable temperature and in a reasonable time. Aluminum panels coated with photoresist and exposed with test patterns were etched with different solutions. Evaluation of each etchant was made by photographing and etched edge at 285X and comparing it with one etched in the etchant. Author (NSA)

N75-16861# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.
[THERMAL CONTROL COATING ABSORPTANCE MEASUREMENT METHODS] Final Report
Nov. 1973 114 p refs In FRENCH
(Contract ESTEC-1440/71-HP)
(ONERA-DERTS-CR-03-79-Rept-32; ESRO-CR(P)-433) Avail: NTIS HC $5.25

Two methods for thermal control coating absorptance measurement were evaluated: the first by Peltier effect, the second by measuring total hemispheric reflectance of samples by means of an integrating sphere. Both methods were developed, and their experimental apparatus and its performance are described and results given. The ultraviolet irradiation apparatus for vacuum testing of the coatings and its performance is also described.
ESRO

N75-16862# Loughborough Univ. of Technology (England). Dept. of Mathematics.
OPTIMAL CONTROL CONCEPTS IN THE DESIGN OF TURBINE DISCS AND BLADES
B. M. E. deSilva Jul. 1974 26 p refs Submitted for publication
(MATHS-RES-42) Avail: NTIS HC $3.75

Analytical and computational procedures for automatically synthesizing turbine disks and blade assemblies on a digital computer using the methods of continuum mechanics, control theory, and optimization techniques are described. The analysis was formulated as a constrained problem in the calculus of variations, the control and state variables being determined by the shape and behavior variables respectively. Diagrams of the redesigned turbine blades resulting from the optimization studies are provided. Author (ESRO)

N75-16863# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron Physics.
MEASUREMENTS ON A TIG WELDING ARC
Dag Andersson Jun. 1974 21 p refs
(TRITA-EPP-74-05) Avail: NTIS HC $3.25

Some measurements were performed on a TIG welding arc in argon between a pointed tungsten rod as cathode and a water cooled copper anode. Experiments with emitting probes to determine the potential distribution in the arc were done, the plasma potential being given by the point of convergence of the characteristics with and without electron emission. In addition, measurements of the current-voltage characteristic of the arc, the current density, and the pressure at the anode were made. Due to imperfect gas shielding, it is sometimes difficult to obtain reproducible results. Author (ESRO)

N75-16864# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
QUALIFICATION AND LIFE TESTING OF A BALL-BEARING FLYWHEEL Final Report
11 Nov. 1974 186 p
(Contract ESTEC-1701/72-AA)
(ESRO-CR(P)-549) Avail: NTIS HC $7.00

The qualification and life testing of a momentum wheel with ball bearings for a 7 to 10 year lifetime, based on the 5 year lifetime Symphonie design, is reported. A tradeoff study covering the overall design, bearings and bearing unit, lubricant and lubrication system, led to the conclusion that no fundamental difficulties impeded the adoption of the existing configuration. Development tests were carried out with special attention to friction torques, and various lubricants. A qualification and life test model was manufactured, and an electronic test rack for the life test program was designed. Results of flight acceptance tests are presented. ESRO

N75-16865# Marconi Space and Defence Systems Ltd., Camberley (England).
THE LUBRICATION OF BEARINGS AND SLIP RINGS IN VACUUM Progress Report, 1972
P. J. ODonnell, C. L. Harris, and M. G. Warwick Paris ESRO Nov. 1974 39 p
(Contract ESTEC-763/69-AA)
(ESRO-CR-214) Avail: NTIS HC $3.75

Bearing tests in vacuum are reported. Results indicate that 100 rpm, lead film lubricated, bearings have lives ranging from 16,000 to 22,000 hours, and grease lubricated bearings have been operating for 9,000 to 17,000 hours without significant change in performance. Lead lubricated bearings operating at 1/90 rpm also show consistent behavior and accelerated tests on these bearings up to 1.0 revs/minute show that the type of behavior at this speed is little changed from slower speed operation, an important factor in accelerated testing. A slip ring rig designed to test both power and signal level contacts has been running in vacuum for 3,000 hours with lower than expected noise levels. Author (ESRO)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-16866# Sandia Labs., Albuquerque, N.Mex.
LOW ENERGY X-RAY MICRORADIOGRAPHY OF LASER FUSION TARGETS
T. S. Prevender and A. W. Lynch 1974 11 p refs Presented at the 23rd Annual Conf. on Appl. of X-ray Analysis, Denver, 7 Aug. 1974 Sponsored by AEC
(SLA-74-5254; Conf-740809-9; SAND-74-0103) Avail: NTIS HC $3.25

A low energy X-ray radiography apparatus was developed

primarily for the nondestructive inspection of LiD laser fusion targets. Exposure times of 15 minutes at 6 keV have been found satisfactory for the detection of voids in nominal 100 micron diameter spheres. Author (NSA)

N75-16867# California Univ., Livermore. Lawrence Livermore Lab.
FAULT TREE ANALYSIS: AN OVERVIEW
Howard Lambert 6 Aug. 1974 17 p refs Presented at the Conf. on Reliability and Fault Tree Analysis, Berkeley, Calif., 3-4 Sep. 1974 Sponsored by AEC
(UCRL-75904; Conf-740906-1) Avail: NTIS HC $3.25

The construction, evaluation, and uses of the fault tree analysis of systems are discussed. NSA

N75-16868# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Angewandte Systemtechnik und Reaktorphysik.
CONTRIBUTION TO DETERMINE COST OPTIMAL LIFE TESTS FOR COMPONENTS WITH EXPONENTIALLY DISTRIBUTED LIFE TIMES Ph.D. Thesis - Karlsruhe Univ.
D. Sellinschegg Jul. 1974 56 p refs In GERMAN
(KFK-2031) Avail: AEC Depository Libraries HC $6.00

The determination of cost optimal plans for life tests is reported. For drawing statistical inference on the basis of the gathered data, the method of testing hypotheses, interval estimates, and the determination of estimators is used. The work determined a plan in such a way that for an optimal statistical decision procedure, the expected experimental cost is as low as possible for a given degree of efficiency for the statistical inference. The investigation is done with a cost model, which considers the investment and operating costs of the test facility, the cost for the component to be tested, and the cost (penalty or bonus) for meeting the specified contract length. Author (NSA)

N75-16869# Bendix Corp., Kansas City, Mo.
BEAM LEAD TESTING, HANDLING, AND FAILURE ANALYSIS Final Report
L. W. Brown Sep. 1974 64 p refs
(Contract AT(29-1)-613)
(BDX-613-Rev) Avail: NTIS HC $4.25

Testing, handling, and failure analysis processes for beam lead semiconductor devices (BLD) were investigated. Experimental BLD reprobing was successful. Limits on probe force and number of reprobes were established for automatic probe equipment. A TO-5 size test header was developed to perform destructive sample testing and was subsequently used to perform qualification testing on devices for a high volume production program. A repeatable process for removal of BLD from as-etched arrays without moving or harming adjacent devices was established for sample removal on lots of purchased BLD. Special techniques were developed for failure analysis of BLD, including removal from circuit paths, probing loose chips for failure verification, mounting for metallurgical cross sectioning, and mounting for scanning electron microscope studies. Author (NSA)

N75-16870# Bendix Corp., Kansas City, Mo.
AUTOMATED VISUAL INSPECTION SYSTEM FOR PRINTED WIRING ASSEMBLIES
R. D. Taylor Oct. 1974 133 p refs
(Contract AT(29-1)-613)
(BDX-613-1076-Rev) Avail: NTIS HC $5.75

An automatic system was needed to improve speed and reliability for visual inspection of printed circuit boards and electronic wiring assemblies. Visual sensors, computer configurations, programs for fault detection and location, computer software systems, and mechanical indexing systems were evaluated. This study served as the basis for a system recommendation. Author (NSA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N75-16871 British Library Lending Div., Boston Spa (England).
MECHANICAL BEHAVIOUR OF MATERIALS UNDER PRESSURE, VOLUME 2
H. Ll. D. Pugh 29 Oct. 1973 3 p Transl. into ENGLISH from the monograph "Mekhanicheskie Svojstva Materialov pod Vysokim Davleniem; Vyp. 2" Moscow, 1973 p 5-7
(BLL-NEL-TT-2510-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Problems associated with the application of high pressures in industrial processes are discussed. Specific areas of the investigation are the use of uniform compression in the industrial deformation of metals and the extrusion of powders, and processes of a kinetic nature, such as the action of shock waves on metals. Metal creep under high pressure is also discussed. M.J.S.

N75-16872 Polish Academy of Sciences, Warsaw.
FINITE ELEMENT METHOD IN THE MECHANICS OF DEFORMED BODIES [METODA ELEMENTOW SKONCZONYH W MECHANICE CIAL ODKSZTALCALNYCH]
Jozef J. Tclega 21 Nov. 1973 88 p refs In POLISH
(Rept-46/1973) Avail: Issuing Activity

A bibliography is presented containing approximately 800 references on the finite element method and its applications in the field of structural mechanics. Brief analyses are also presented of some references in the area of fluid mechanics, hydroelasticity, fracture mechanics, and shell structure. Transl. by M.J.S.

N75-16873 Polish Academy of Sciences, Warsaw.
DETECTION OF VIBRATIONS IN ELECTROACOUSTIC CONVERTERS [DETEKCJA DRGAN PRZETWORNIKOW ELEKTROAKUSTYCZNYCH]
Zygmunt Toczyski 31 Dec. 1973 13 p refs In POLISH
(Rept-55/1973) Avail: Issuing Activity

A method is presented for detecting vibrations by using a differential transformer. It was found that this method can be used for stabilizing the vibrations of an instrument attached to a magnetostrictive converter used in different ultrasonic technologies. Other topics discussed include ultrasonic devices, piezoelectric sensors, electrical bridges, and amplitude shifts. Transl. by M.J.S.

N75-16874 Naval Research Lab., Washington, D.C. Shock and Vibration Information Center.
THE SHOCK AND VIBRATION DIGEST, VOLUME 6, NO. 9
Henry C. Pusey, ed. and Robert Belsheim, ed. Sep. 1974 104 p refs
(AD-787719) Avail: Director, Navy Publ. and Printing Service Office, Naval District of Washington, Building 157-2, Washington Navy Yard, Washington, D. C. 20390: $15.00/set CSCL 20K

A bibliography of technical documents on shock and vibration is presented. Some of the subjects discussed are: (1) classification of dynamic balancing machines, and (2) the proceedings of a symposium on shock and vibration. Abstracts of technical documents are provided for broad categories such as analysis and design, computer programs, environment tests, finite element methods, and statistical analysis. Author

N75-16875 Naval Research Lab., Washington, D.C. Shock and Vibration Information Center.
THE SHOCK AND VIBRATION DIGEST, VOLUME 6, NO. 10
Henry C. Pusey, ed. and Robert Belsheim, ed. Oct. 1974 90 p refs
(AD-787722) Avail: Director, Navy Publ. and Printing Service Office, Naval District of Washington, Building 157-2, Washington Navy Yard, Washington, D. C. 20390: $15.00/set CSCL 20K

A bibliography of documents concerning shock and vibration research is presented. Some of the subjects discussed are; (1) parallel flow induced vibrations and instabilities of cylindrical structures and (2) the dynamics of rotors. Abstracts of documents are included for broad subject categories such as analysis and design, optimization techniques, statistical methods, variational methods, finite element modeling, and standards and specifications. Author

N75-16876# National Aeronautical Establishment, Ottawa (Ontario).

STRESS CONCENTRATION FACTORS FOR A FATIGUE TEST SPECIMEN WITH A U-TYPE NOTCH IN ONE EDGE BY FINITE ELEMENT ANALYSIS

J. F. DeWaal 2 Aug. 1974 27 p refs
(LTR-ST-721) Avail: NTIS HC $3.75

A rectangular fatigue test specimen plate with a U-type notch in one edge is idealized for finite element analysis by an automatic routine to obtain nodes and elements. The plate is loaded in tension by a linearly distributed load along the short edges. The distance from the resultant load to the unnotched edge of the plate is varied. The stress concentration factor is computed from the maximum stress occurring in the notch root. For comparison a formula is derived for a similar plate with a hyperbolic notch based on the theory of elasticity. The results are also compared with data obtained from other sources.
Author

N75-16877# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
EFFECTS OF ARTIFICIAL CRACKS AND POISSON'S RATIO UPON PHOTOELASTIC STRESS INTENSITY DETERMINATION

M. Jolles, J. J. McGowan, and C. W. Smith Nov. 1974 24 p refs
(Grant NSF GK-39922)
(VPI-E-74-29) Avail: NTIS HC $3.25

A series of stress freezing photoelastic experiments were performed with multiple replications upon edge cracked stips for three types of cracks in current use: (1) rectangular slots 0.152 mm wide; (2) 1.59 mm wide slots terminating in a 30 deg vee notch of approximately 0.025 mm root radius; and (3) natural cracks. Stress intensity results were compared with the Gross-Srawley analysis and Savin's solution. It was concluded that results type two and three cracks were about 12% higher than the Gross-Srawley results, and type one cracks yield even higher results. This is conjectured to be related to a Poisson's ratio effect.
Author

N75-16878# Lockheed Missiles and Space Co., Palo Alto, Calif.
INFLUENCE OF AXISYMMETRIC IMPERFECTIONS IN SHAPE ON THE BIFURCATION POINT OF AXISYMMETRIC EQUILIBRIUM OF SHELLS OF REVOLUTION

P. E. Tovstik [1975] 7 p refs Transl. into ENGLISH from Vestn. Leningr. Univ. Ser. Mat. Mekhan. Astron. (Leningrad), no. 19, 1974 p 102-108
Avail: NTIS HC $3.25; National Translation Center, John Crerar Library, Chicago, Ill. 60616

Starting with the function that describes an axisymmetric dent on a thin shell, the bifurcation of the axisymmetric equilibrium is solved by the Mushtari-Donnell-Vlasov equation.
F.O.S.

N75-16879# Lockheed Missiles and Space Co., Palo Alto, Calif.
VIBRATIONS AND STABILITY OF SHELLS WEAKENED BY HOLES

A. N. Guz, I. S. Chernyshenko, Val. N. Chekhov, and Vik. N. Chekhov [1975] 23 p refs Transl. into ENGLISH from the book "Tsilindricheskie Obolochki, Oslableenye Otverstiiami" Kiev, Naukova Dumka, 1974 p 231-255
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The solution of the problem of the stability and vibrations of shells with cutouts is discussed. A survey of the theoretical and experimental stability investigations of shells with holes as well as an analysis and generalization of the results obtained are presented along with possible paths of futher investigations. Major factors considered are: (1) elastic stability of shells weakened by circular holes; (2) stability of shells with rectangular holes; (3) stability of shells with holes in the elastic-plastic domain; and (4) vibrations of shells weakened by circular and rectangular holes. The vibrations of shells of revolution are considered and results are presented of a numerical investigation of the natural vibrations frequencies and modes for shells with one free circular hole.
J.M.S.

N75-16880# ASE, Inc., Pennsauken, N.J.
DEVELOPMENT AND TEST OF LOW IMPACT RESISTANCE STRUCTURES. VOLUME 1: STRUCTURAL AND DYNAMIC ASPECTS Final Report, Phase 1

Robert W. Harralson, Charles W. Laible, and John Lazarin Feb. 1974 165 p
(Contract DOT-FA72WA-3043)
(AD-783185; FAA-RD-73-187-1-Vol-1) Avail: NTIS HC $5.00

A breakaway pole has been designed and developed and tested to satisfy the requirements for a frangible light support structure. This pole consists of four tapered sections and one straight section assembled to form a unitary structure approximately 20 feet high. The basic structure is shown by analysis to satisfy the requirements for survival in a 75 mph wind with 1/2" in. of radial ice, and a 100 mph wind with no radial ice, with factors of safety of 4.3 and 3.2 respectively. Deflection under a 45 mph wind is 0.6 of the allowable value. Tests of the joints in the pole were performed to optimize the pole performance. An impact test using an instrumented impactor was designed and developed under this contract. Utilizing the impactor mounted on a catapult carriage at the NASA Langley Research Center, the newly developed pole is shown to exhibit frangibility superior to other structures currently in use by factors ranging from 2.5 to 10.0.
Author

N75-16881# Oklahoma State Univ., Stillwater.
DYNAMIC RESPONSE OF NONCIRCULAR STIFFENED CYLINDRICAL SHELLS WITH RECTANGULAR CUTOUTS Ph.D. Thesis

Mahabaliraja Dec. 1974 140 p refs
(Contract F08635-71-C-0199)
Avail: NTIS HC $5.75

A method is developed for the dynamic analysis of noncircular stiffened cylindrical shells with rectangular cutouts. This method is based on the Rayleigh-Ritz technique using beam characteristics (axially) and trigonometric (circumferentially) functions in the displacement series. Studies were made to determine the effect on the frequencies and modes of; (1) cutout size and (2) cutout location. The effect of the cutout on the displacement and stress responses of an unstiffened shell subjected to an air blast type of transient load.
Author

N75-16882# Grenoble Univ. (France).
MODERN METHODS OF EVALUATING THE SAFETY OF PRESSURIZED APPARATUS

R. Roche [1974] 49 p refs In FRENCH Presented at Actualization of the Concept of Safety in Mech. Construct., Paris, 6-7 Jan. 1974
(CEA-Conf-2596; Conf-740128-1) Avail: AEC Depository Libraries HC $5.50

A review is given of the concepts governing the evaluation of the safety of pressurized apparatus. Damage statistics and risks are defined. The evolution of dimensioning methods is outlined. The types of destruction are then described. These include excessive deformation, plastic instability, elastic or elasto-plastic instability, progressive deformation, fatigue fissures, and abrupt rupture. Each of these is analyzed and the conditions leading to their occurrence are indicated.
NSA

N75-16883# Sandia Labs., Livermore, Calif.
GNATS: A FINITE ELEMENT COMPUTER PROGRAM FOR THE GENERAL NONLINEAR ANALYSIS OF TWO-DIMENSIONAL STRUCTURES

R. C. Young and M. L. Callabresi Oct. 1974 102 p refs
(Contract AT(29-1)-789)
(SLL-74-0023) Avail: NTIS HC $5.25

GNATS is a system of three user-orientated finite element computer programs designed for the nonlinear analysis of axisymmetric and two-dimensional static structures. A preprocessor program, MESH2, provides the two-dimensional finite element mesh. The main program, GNATS, solves the nonlinear structural problem, including the effects of large displacements, large strains, and elastic-plastic material behavior. A Lagrangian coordinate system is used in GNATS for describing the equilibrium configuration of the body. A post-processor program, GPRINT, prints the selected values of displacements, stresses, and strains. The input data required for using MESH2, GNATS, and GPRINT for a nonlinear structural analysis is described. Dynamic dimensions were used for all arrays in these programs. The maximum problem size, therefore, is limited only by the computer being used. All input data from cards is specified in a free-field format and

may be assembled into the data decks in any order.
Author (NSA)

N75-16884# Sandia Labs., Livermore, Calif.
FINITE DIFFERENCE COMPUTATIONS OF THE DYNAMIC MOTION OF CYLINDRICAL SHELLS INCLUDING THE EFFECT OF ROTATORY INERTIA
A. F. Emery and F. J. Cupps Oct. 1974 53 p refs
(Contract AT(29-1)-789)
(SLL-73-0071) Avail: NTIS HC $4.25

The accuracy of several finite difference methods for computing the dynamic motion of cylindrical shells was studied. Wave speeds, dispersion effects, and truncation errors were evaluated by comparing the results of the finite difference and Fourier series solutions using Flugge's shell theory and the transverse shell and rotatory inertia theory. The finite difference models used algorithms based upon the differential equations and upon the conservation equations, with the latter results shown to be less sensitive to the mesh size and in better agreement with the Fourier series results. A frequency analysis of all the algorithms and the Fourier series demonstrated that finite difference spectra had a very considerable gap that slowly closed as the mesh size decreased. A new algorithm was based upon these spectra and is shown to yield good results while permitting increases in the computing speeds by the factor mesh size/shell thickness. Author (NSA)

N75-16885# Sandia Labs., Livermore, Calif.
FLYER PLATE TECHNIQUE FOR QUANTITATIVELY MEASURING THE ADHESION OF PLATED COATINGS UNDER DYNAMIC CONDITIONS
J. W. Dini and H. R. Johnson Aug. 1974 30 p refs Presented at the Properties of Electrodeposits Symp., New York, Oct. 1974
(Contract AT(29-1)-789)
(SU-74-5006; Conf-741029-1) Avail: NTIS HC $3.75

A method developed for shock wave testing of materials worked quite well for quantitatively assessing the adhesion of deposits plated on various substrates. The procedure consists of utilizing magnetic repulsion to accelerate thin, flat metal flyer plates against substrates under test. Evaluation of nickel, copper, and nickel-cobalt electrodeposits plated on various high-strength stainless steels showed the dynamic test to be more discriminating than conventional static tests. Author (NSA)

N75-16886# European Space Research Organization, Paris (France).
THE BUCKLING BEHAVIOUR OF TRANSVERSE LOADED CIRCULAR CYLINDERS
Peter Schroeder Nov. 1974 119 p refs Transl. into ENGLISH of Ueber das Beulverhalten querkraftbelasteter Kreiszylinder, DLR-FB-73-62, DFVLR, 30 Mar. 1973
(ESRO-TT-105; DLR-FB-73-62) Avail: NTIS HC $5.25; DFVLR, Porz, West Ger. 21.50 DM

The buckling behavior of isotropic and orthotropic transverse loaded cantilevered cylindrical shells is investigated. The calculation is based on Donnell's linear shallow shell theory. The theoretical results are determined by Galerkin's approximation method. At short cylinders the limit of stability occurs in shear buckling modes, at long cylinders in bending buckling modes. A comparison of orthotropic cylinders of equal weight (plywood) demonstrates, that the buckling load of short ringstiffened cylinders can exceed considerably the buckling load of short longitudinal-stiffened cylinders. Furthermore experiments on Astralon-, Mylar- and plywood cylinders are described. The comparison of calculated buckling modes and buckling loads with experiments shows good agreement. Author (ESRO)

N75-16887# Southampton Univ. (England). Inst. of Sound and Vibration Research.
ON THE ISOLATION OF MACHINERY FROM FLEXIBLE FOUNDATIONS
M. G. Milsted Dec. 1973 37 p refs Sponsored by Sci. Res. Council.
(ISVR-TR-63) Avail: NTIS HC $3.75

An analysis of the isolation problem was developed wherein positions of a building structure might be included to account for foundation flexibility. The problem was treated as one of interaction of three separate subsystems; a source, a transmission structure such as system of isolators, and a foundation or receiver. The source was constrained to have only rigid-body motions and the isolators were taken as parallel spring-damper combinations. The foundation part of the system was formulated in terms of a normal-mode receptance series incorporating hysteretic damping. As a measure of the effectiveness of an isolation system, the space-average mean square response of the foundation was used. The analytical formulation was applied to beam-type foundations where only plane motions of the source were allowed. A physical model of the plate system was installed using a source-receiver apparatus. Author (ESRO)

N75-16888# Southampton Univ. (England). Inst. of Sound and Vibration Research.
ACOUSTICALLY INDUCED VIBRATION OF, AND SOUND RADIATION FROM, BEAMS INSIDE AN ENCLOSURE
S. N. Yousri and F. J. Fahy Mar. 1974 40 p refs Sponsored in part by Clark Chapman-John Thompson Ltd. and Central Elec. Generating Board
(ISVR-TR-67) Avail: NTIS HC $3.75

The response of a single cylindrical beam to pure-tone sound in a rectangular reverberation chamber was analyzed. The variation of the response with position within the chamber and the effect of proximity of other similar, parallel beams was considered. A reciprocity relation was established between the response of a beam to sound in the chamber and the sound radiation by such motion when otherwise generated; this relation was found to be valid even for non-diffuse fields, below the Schroeder large room frequency. The sound radiation from a beam in multimode vibration was also analyzed. The mean square velocity response, averaged over all possible beam positions within the chamber, was found to be directly proportional to the radiation loss factor of that vibrational mode and inversely proportional to frequency to the third power. The maximum normalized response occurs when the beam is excited in its fundamental vibrational mode. Experiments were made to measure the normalized average response of aluminum tubing. Author (ESRO)

N75-16889# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft-und Raumfahrtkonstruktionen.
SOME CONSIDERATIONS FOR THE EVALUATION OF FINITE ELEMENT MODELS
J. H. Argyris and K. J. William 1973 54 p refs Presented at the 2nd Intern. Conf. on Structural Mech. in Reactor Technol., Berlin, 10-14 Sep. 1973 Sponsored partly by Bundesmin. fuer Forsch. und Technol.
(ISD-147) Avail: NTIS HC $4.25

Topics are discussed within the context of finite element discretization of structures, the evaluation of stiffness properties, and the computation of stresses. Different polynomial expansions were studied on a typical example in regard to accuracy and efficiency. An attempt was made to improve the stiffness of the displacement model by direct approximation of the strain field as opposed to its derivation from the displacement field. Alternatively, the order of numerical integration was reduced, the effect of which was then compared with the mixed model above. An integral procedure was developed for the direct approximation of element stresses as opposed to the local stress computation in which the stresses are derived from the displacement field. Numerical examples are presented to illustrate the effects of different stress evaluation techniques for displacement models. Author (ESRO)

N75-16890# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft-und Raumfahrtkonstruktionen.
RECENT DEVELOPMENTS IN THE FINITE ELEMENT ANALYSIS OF PRESTRESSED CONCRETE REACTOR VESSELS
J. H. Argyris, G. Faust, J. Szimmat, E. P. Warnke, and K. J. William 1973 68 p refs Sponsored partly by Bundesmin. fuer Forsch. und Technol. Submitted for publication
(ISD-151) Avail: NTIS HC $4.25

Recent developments in the nonlinear deformation and ultimate load analysis of prestressed concrete reactor vessels using finite elements are described. First a number of finite element models are called to attention for the idealization of composite structures such as reinforced and prestressed concrete compo-

nents. Different inelastic constitutive models are proposed for the behavior of concrete in the pre and post failure regime. Subsequently various numerical techniques are examined for the solution of nonlinear problems, especially with regard to their distortion of the constitutive model. In conclusion these modeling techniques are applied to the analysis of four typical examples: The nonlinear deformation analysis of a concrete specimen subjected to biaxial compression, the crack analysis of a thick walled concrete cylinder, the overload analysis of the 1:5 scale model, and the ultimate load analysis of a concrete top closure model. Author (ESRO)

N75-16891# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

LARGE NATURAL STRAINS AND SOME SPECIAL DIFFICULTIES DUE TO NON-LINEARITY AND INCOMPRESSIBILITY IN FINITE ELEMENTS

J. H. Argyris, P. C. Dunne, T. Angelopoulos, and B. Bichat Jul. 1974 81 p refs

(ISD-158) Avail: NTIS HC $4.75

Some topics in the treatment of nonlinear problems by the finite element method are examined. The concept of natural strains and stresses is extended to large strains in simplex finite elements. Some algorithms developed for structural dynamics are applied to the problem of nonlinear wave propagation including a case of shock development. Special difficulties arising when displacement finite elements are used to solve problems with incompressible or nearly incompressible material are discussed with numerical examples. ESRO

N75-16892# Southampton Univ. (England). Inst. of Sound and Vibration Research.

CONSTRAINED LAYER DAMPING APPLIED TO A CANTILEVER TUBE

A. Hotchkiss Apr. 1974 94 p refs Sponsored by Min. of Defence

(ISVR-TR-64) Avail: NTIS HC $4.75

A sixth order differential equation of motion was derived for the flexural vibrations of a beam of hollow circular cross-section to which damping was introduced by the addition of a constrained viscoelastic shear layer. Solutions were obtained for clamped free end conditions of a beam having an arbitrary number of constraining segments around its circumference, and a parameter study was made in order to show the variation of the beam modal loss factor with various parameters important in the design of damped structural composites. A design procedure which indicates the optimum use of the theoretical results in damping the flexural motions of cantilever mast type structures is described, and it is shown that the choice of both the damping material and the constraining segment material greatly affects the modal loss factors which may be obtained. A design example is given for a typical damped structure in which the use of various engineering materials is considered. Laboratory experiments were carried out on a constrained layer cantilever tube in order to compare the first three modal loss factors with those predicted theoretically, and a good agreement was obtained. Author (ESRO)

N75-16893# Institut fuer Festkoerpermechanik, Freiburg (West Germany).

A METHOD FOR THE DETERMINATION OF MIXED MODE STRESS INTENSITY FACTORS AND ITS APPLICATION TO A CRACK IN THE NEIGHBORHOOD OF A CIRCULAR HOLE [BESTIMMUNG VON SPANNUNGSFAKTOREN BEI GEMISCHTEN BEANSPRUCHUNGSARTEN AM BEISPIEL EINES RISSES IN DER UMGEBUNG EINES KREISLOCHS]

G. Klein Jan. 1974 99 p refs In GERMAN; ENGLISH summary

(IFKM-WB-1/74) Avail: NTIS HC $4.75

A photoelastic method was developed to determine the stress intensity factors K sub 1 and K sub 2 for cracks subjected to mixed-mode loading. The constants in the near field expansion about the crack tip were computed using a non-linear optimization program to give a best fit to the observed isochromatics. Copying the latter onto an equal density film increased their sharpness and, thus, the accuracy of the determination. The method was applied to cracks lying perpendicular to the external stress near a circular hole in a plate under uniaxial tension and the results were used to describe the paths of cracks in the neighborhood of a hole. Author (ESRO)

N75-16894# Institut fuer Festkoerpermechanik, Freiburg (West Germany).

FRACTURE BEHAVIOR OF SOME CASE-HARDENED MATERIALS

Gerhard Sperl Apr. 1974 45 p refs In GERMAN Sponsored by Min. fuer Mittelstand und Verkehr Baden-Wuerttemberg

(IFKM-WB-3/74) Avail: NTIS HC $3.75

Fracture mechanical and fractographical tests of the case hardened steels 20 MnCr 5 and 30 CrNiMo 8 are discussed. Crack propagation, fracture strength, hardness, and bending were measured. The addition of too much carbon had an unfavorable influence on fracture strength and crack propagation and also led to early formation of fatigue cracks. ESRO

N75-16895# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).

BUCKLING OF A THIN-WALLED SPHERICAL PRESSURE VESSEL FIXED ON A RING SUPPORT BY TENSIONED STRAPS

B. Geier and K. Rohwer 1974 20 p refs

(Contract ESTEC-2201/74-GW)

(IB-152-74/20; ESRO-CR(P)-477) Avail: NTIS HC $3.25

The COS-B satellite contains two subsystems which make use of pressurized gas, nitrogen and neon. Supplies of these gases are held on board in four spherical tanks. During qualification tests the tanks have to be vibrated at reduced internal pressures, but have to be fixed by the straps strong enough to ensure safe support. The stabilizing effect of internal pressure being reduced, the strap tension might induce buckling of the tanks. A study was performed to establish the values of strap tension leading to buckling in empty gas tanks and what internal pressure would be required to stabilize the tanks during the tests. ESRO

N75-16896# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.

A SURVEY OF DATA ON DAMPING IN SPACECRAFT STRUCTURES Final Report

1974 104 p refs Prepared jointly with Natl. Aerospace Lab.

(Contract ESTEC-2142/73-PP)

(FOK-RV-75-56; ESRO-CR(P)-539) Avail: NTIS HC $5.25

Experimental data from vibration tests carried out on complete ESRO satellites at qualification and flight acceptance level were collected and analyzed to estimate the damping of the different types of structure. Methods for determining damping from test data are reviewed and compared. Factors affecting quality of data such as notching and resonant frequencies are noted and recommendations on test planning adequate for obtaining acceptable data for structural damping estimation are laid out. Vibration and acoustic test results for honeycomb sandwich structures are also collected from literature to examine the influence of basic design parameters on the damping. ESRO

N75-16897# European Space Research Organization, Paris (France).

A STATISTICAL APPROACH TO THE VIBRATORY DYNAMICS OF STUCTURES

Alain Bourgine Oct. 1974 199 p refs Transl. into ENGLISH of Sur une Approche Statistique de la Dynamique Vibratoire des Structures, ONERA-P-149, ONERA, 3 Apr. 1973

(ESRO-TT-98; ONERA-P-149) Avail: NTIS HC $7.00

The analysis of the vibratory dynamics of a linear structure is treated by a nonmodal method of an asymptotic and statistical type. It is based upon the study of the propagation conditions of wave bursts (for the geometrical approximation) and, dispensing with the concept of the deterministic system, describes the mean properties of this vibratory field via the fundamental concepts of modal density and of the generalized Green function. The classical results of modal density calculation are extended to the case of lacally homogeneous media. The relations linking modal density to group velocity and input admittance of a structure are established or are generalized. Author (ESRO)

N75-16898# European Space Research Organization, Paris (France).

THE LINEAR THEORY OF SHELLS AND ITS APPLICATION

TO INELASTIC CALCULATIONS
Roger Valid Nov. 1974 245 p refs Transl. into ENGLISH of La Theorie Lineaire des Coques et son Appl. aux Calculs Inelastiques, ONERA-P-147, ONERA, 9 Feb. 1973
(ESRO-TT-109; ONERA-P-147) Avail: NTIS HC $7.50

The linearized theory of thin shells is applied to the case of large displacements and large deformations out of the elastic range, with or without transverse shear strain. The equilibrium is written by means of the virtual displacements principle, from the three-dimensional formulation and from kinematic hypotheses, in particular for the thickness variation. This classical method is set down with a new geometrical formulation which makes easy the study of compatibility of the linear generalized deformations as well as that of the generalized stress functions. The conditions of closure relative to these two problems are written also on the boundaries in the case of multiconnex shells. These questions are then treated again and associated by use of variational methods. Some considerations are given concerning the numerical incremental resolution, in particular by the finite element method. The linearized direct and complementary energy methods also are described. Author (ESRO)

N75-16899# Sydney Univ. (Australia). Civil Engineering Labs.
INELASTIC BUCKLING OF SIMPLY SUPPORTED STEEL I-BEAMS
S. Kitipornchai and N. S. Trahair Apr. 1974 43 p refs
(PB-236099/8; R-244) Avail: NTIS HC $3.75 CSCL 13M

An experimental investigation was made of the inelastic flexural-torsional buckling of rolled steel I-beams. Tests were carried out on full-scale simply-supported beams with central concentrated loads applied with a gravity load simulator. Specially designed roller supports allowed the end cross sections of each test beam to rotate about the major and minor axes and to warp freely, but restrained them against twisting about the longitudinal axis. Load was applied through a loading yoke which practically eliminated any restraining effects of the applied load. GRA

N75-16900# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
FORCED VIBRATIONS OF CIRCULAR FOUNDATIONS ON LAYERED MEDIA
Eduardo Kausel Jan. 1974 242 p refs
(Grant NSF GI-35139)
(PB-236312/5; R-74-11; Publ-336) Avail: NTIS HC $7.50 CSCL 13M

The general three-dimensional problem of an axisymmetric footing resting on (or embedded in)a semi-infinite viscoelastic layered stratum and subjected to arbitrary non-axisymmetric forced excitations is investigated by means of finite elements using a consistent energy-absorbing boundary. Comparisons are made with known analytical solutions for special cases involving parametric variations of the relative dimensions, properties and/or geometry. A general agreement with the theoretical halfspace solution is found, as well as with the results obtained from an approximate equivalent plane strain model. GRA

N75-16901# Sydney Univ. (Australia). Civil Engineering Labs.
BUCKLING OF INELASTIC I-BEAMS UNDER MOMENT GRADIENT
S. Kitipornchai and N. S. Trahair Feb. 1974 32 p refs
(PB-235834/9; R-237) Avail: NTIS HC $3.75 CSCL 13M

The inelastic flexural-torsional buckling of steel I-beams under moment gradient is investigated. A model developed for the inelastic buckling of beams under uniform moment, which accounts for strain-hardening, residual stresses, and monosymmetry of the yielded cross-section, is extended to the case of moment gradient by allowing for the effects of non-uniform yielding. A tangent modulus theory of buckling is used, and the governing differential equations are adapted from those which govern the elastic flexural-torsional buckling of tapered monosymmetric I-beams of constant depth. GRA

N75-16940 Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL FACTORS OF THE THERMAL REGIME OF BUILDINGS
I. A. Kazantsev *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 158-160 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 118-119
(For availability see N75-16922 08-42)

42 GEOSCIENCES (GENERAL)

N75-16902 British Library Lending Div., Boston Spa (England).
COOPERATION ON THE 180TH MERIDIAN
K. Kondratyev 11 Dec. 1973 5 p Transl. into ENGLISH from Pravda (Moscow), 25 Nov. 1973
(BLL-M-23290-(5828.4F)) Avail: British Library Lending Div., Boston Spa., Engl.: 1 BLL photocopy coupon

A joint Soviet-American expedition which carried on research in the Bering Sea area is briefly described. N.E.R.

N75-16903 British Library Lending Div., Boston Spa (England).
SCIENTISTS EXPLORE THE MOUNTAINS
A. Malyugina [1974] 3 p Transl. into ENGLISH from the Russian
(BLL-M-23465-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A Soviet-French symposium headlined Caucasus-Alps is being planned. The symposium will discuss and examine problems related to the study of geomorphology, climate, ancient and modern glaciation, regularities in the vertical zoning of soils, flora and fauna, the development of health resorts, tourism, and mountaineering. Author

N75-16904*# Scientific Translation Service, Santa Barbara, Calif.
RADAR METEOROLOGY
Ye. M. Salman, ed. Washington NASA Jan. 1975 162 p refs Transl. into ENGLISH of the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 1-120 Prepared for JPL
(Contract NAS7-100)
(NASA-TT-F-14797; JPL-113) Avail: NTIS HC $6.25 CSCL 04B

Hydrometeorological parameters are studied in radar imagery of cloud covers and atmospheric precipitation. For individual titles, see N75-16905 through N75-16920.

N75-16905* Scientific Translation Service, Santa Barbara, Calif.
REFINEMENT OF THE BASIC RADAR EQUATION FOR CLOUDS AND PRECIPITATION **c47**
Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 1-6 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 3-7 (For availability see N75-16904 08-42) CSCL 04B

A derivation of the basic radar equation for clouds and precipitation is given that takes into account the antenna radiation pattern. The reasons for the differences in the equations used by various authors are demonstrated. More rigorous forms for writing down the basic equation are given. Author

N75-16906* Scientific Translation Service, Santa Barbara, Calif.
THE ROLE OF LARGE PARTICLES IN THE FORMATION OF THE RADIO ECHO **c32**
Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 7-13 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 8-13 (For availability see N75-16904 08-42) CSCL 17I

The contribution to the total reflectivity of separate parts of a particle spectrum described by a gamma distribution is estimated. It is shown that the largest individual particles, whose percent concentration is 0.1 - 1, originate approximately 60 - 70% of the total reflectivity of the spectrum. Explanations are given of a number of effects which confirm the dominant role of large particles in the formation of the echo. Author

N75-16907* Scientific Translation Service, Santa Barbara, Calif.
THE INFLUENCE OF INHOMOGENEITY OF THE REFLECTIV-

ITY DISTRIBUTION ON THE ACCURACY OF ITS MEASUREMENT c47

Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 14-19 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 14-18 (For availability see N75-16904 08-42)
CSCL 04B

The influence of pulse volume dimensions on the accuracy of reflectivity from various clouds is considered. It is shown that due to the spatial averaging and the inhomogeneities of the clouds, the dependence frequently breaks down, which is a cause of lower values of the spatial distribution estimate. Values of the corrections calculated for various conditions are presented. Author

N75-16908* Scientific Translation Service, Santa Barbara, Calif.
ON THE ERRORS IN USING THE RAYLEIGH APPROXIMATION FOR ESTIMATING THE REFLECTIVITY OF CLOUDS AND PRECIPITATION c47

Ye. M. Salman and B. M. Yerukhimovich *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 20-27 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 19-25 (For availability see N75-16904 08-42)
CSCL 04B

The accuracy of using the Rayleigh approximation for the description of polydisperse diameters of backscattering water and ice spheres is examined. Calculations are carried out on the ratio of scattering diameters according to the Mie and Rayleigh formulas for the spectra of rain and dry and moist hailstones. The limits of applicability of the Rayleigh approximation for various wavelengths are shown. Author

N75-16909* Scientific Translation Service, Santa Barbara, Calif.
PROBABILITY DISTRIBUTION FUNCTIONS OF ECHO SIGNALS FROM METEOROLOGICAL TARGETS c47

G. V. Vasilyev *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 28-38 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 26-33 (For availability see N75-16904 08-42)
CSCL 04B

Simple expressions are obtained for the laws and moments of the probability distributions of averaged echo signals from meteorological targets at the output of a logarithmic radar receiver. Here, the distribution function is assumed to be represented in the form of an Edgeworth series. Author

N75-16910* Scientific Translation Service, Santa Barbara, Calif.
RADAR CHARACTERISTICS OF CLOUD FIELDS c47

B. Sh. Divinskaya *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 39-57 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 34-47 (For availability see N75-16904 08-42)
CSCL 04B

Relations of several statistical parameters of the radio echo field to the types of cloud systems and weather phenomena in the cloud field are studied. Combinations of the statistical characteristics of radio echo are found which in certain cases permit the unique classification of cloud field according to the types of phenomena. The space-time variability of the radar characteristic was examined in connection with the transformation of the cloud field, and the question of the variation of the statistical characteristics of the echoes from cloud field was examined in connection with changes in the dimensions of the quantization cell. Author

N75-16911* Scientific Translation Service, Santa Barbara, Calif.
METHODS OF DISCRIMINATING CLOUD SYSTEMS BY THEIR RADAR CHARACTERISTICS c47

B. Sh. Divinskaya *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 58-71 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 48-57 (For availability see N75-16904 08-42)
CSCL 04B

The connection of the radar characteristics of cloud systems with the genetics of their formation, the microphysical structure, and the spatial extent of the clouds is examined. The relation of the probability of detecting clouds at various distances by their microphysical structure and the capabilities of the equipment are also considered. A method of discriminating cloud systems is proposed on the basis of obtained relations. Author

N75-16912* Scientific Translation Service, Santa Barbara, Calif.
THE PROBLEM OF REGIME SUMMARIES OF THE DATA FROM RADAR OBSERVATIONS c47

B. Sh. Divinskaya and Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 72-81 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 58-63 (For availability see N75-16904 08-42)
CSCL 04B

Peculiarities of the radar information about clouds are examined in comparison with visual data. An objective radar classification is presented and the relation of it to the meteorological classification is shown. The advisability of storage and summarization of the primary radar data for regime purposes is substantiated. Author

N75-16913* Scientific Translation Service, Santa Barbara, Calif.
OPTIMAL FORM AND FREQUENCY OF PRESENTATION OF RADAR DATA ON CLOUDS AND PHENOMENA CONNECTED WITH THEM c47

Ye. M. Salman and B. Sh. Divinskaya *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 82-94 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 65-74 (For availability see N75-16904 08-42)
CSCL 04B

The available data on the space and time structure of the radio echoes from different clouds is examined. On the basis of their analysis, a basis is given for the optimal form of presentation and the operational quality of renewal of radar information used for operational purposes in ZGMO and the TGMTs. Author

N75-16914* Scientific Translation Service, Santa Barbara, Calif.
ON THE PROBLEM OF ADJUSTING THE CRITERION FOR DISCRIMINATING PHENOMENA ACCOMPANYING SUMMERTIME Cb c47

S. B. Gashina, T. D. Kotova, L. I. Kuznetsova, and Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 95-104 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 75-81 (For availability see N75-16904 08-42)
CSCL 04B

The dependence is shown of the complete and simplified Y criteria on the instability energy E. Regression equations are presented of the relation of the criterial values of Y of severe hail and severe weather clouds with the variable E. The adjustment of Y according to the value of E calculated from the radiosonde data is recommended as one of the possible methods. Author

N75-16915* Scientific Translation Service, Santa Barbara, Calif.
ON A POSSIBLE METHOD FOR DAILY ADJUSTMENT OF SEVERE STORM RADAR CRITERIA c47

G. B. Brylev and Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 105-110 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 82-85 (For availability see N75-16904 08-42)
CSCL 04B

A method is proposed of adjusting the radar criteria for severe storms, taking into account the height of the minus 22 C isotherm, the minimum value of the maximum magnitude of the radar reflectivity in thunderstorms at the same level for a specific region, and the various types of homogeneous air masses in the air. Formulas for the criteria are presented which take into account specified errors of discrimination. Author

N75-16916* Scientific Translation Service, Santa Barbara, Calif.
COMPARATIVE ESTIMATE OF THE EFFECTIVENESS OF DIFFERENT ALGORITHMS FOR THE RADAR CLASSIFICATION OF THUNDERSTORMS AND SHOWERS c47

A. G. Linev, V. S. Oprishko, N. D. Popova, and Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 111-116 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973

p 86-89 (For availability see N75-16904 08-42)
CSCL 04B

Several schemes for discriminating severe weather phenomena with the aid of different algorithms are examined. The schemes were tested on the same sample. A comparative estimate of the effectiveness of the different algorithms for classifying thunderstorms and showers is carried out. Author

N75-16917* Scientific Translation Service, Santa Barbara, Calif.
A COMPARISON OF INFORMATION ON CLOUDS AND PHENOMENA ACCOMPANYING Cb OBTAINED FROM SURFACE AND RADAR NET STATIONS **c47**
S. B. Gashina, L. I. Matveyeva, and A. A. Razumovskiy *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 117-124 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 90-94 (For availability see N75-16904 08-42)
CSCL 04B

Methods and criteria are proposed for the comparison of surface and radar data on clouds and phenomena accompanying Cb. It is shown that the effectiveness of the radar information on thunderstorms from a net over the territory of the BSSR is approximately 3 times greater than that of visual observations obtained from the station net. Author

N75-16918* Scientific Translation Service, Santa Barbara, Calif.
ON THE PROBLEM OF RADAR EFFECTIVENESS OF DISCRIMINATING THUNDERSTORMS AND CLOUDS **c47**
P. A. Allenov and R. M. Zrazhevskaya *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 125-133 Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 95-100 (For availability see N75-16904 08-42)
CSCL 04B

Data are presented on the effectiveness of detecting clouds (within a radius of 40 km) and thunderstorms (within a radius of 300 km) with the aid of instrumental (WR) and visual (weather station net) observations in the operational service of aviation. Data obtained on a large statistical sample confirm the very great effectiveness of the radar method of observations for thunderstorms and clouds with precipitation. The origin of certain probabilities for detecting stratiform clouds without precipitation which are small compared with the data of other authors is explained. Author

N75-16919* Scientific Translation Service, Santa Barbara, Calif.
ON THE LIDAR DETERMINATION OF ATMOSPHERIC TRANSMITTANCE **c46**
V. D. Stepanenko and V. V. Vasiliev *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 134-143 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 101-108 (For availability see N75-16904 08-42)
CSCL 04A

A solution of the lidar equation is given with the aim of determining the attenuation coefficient of the atmosphere under conditions of the existence of a relation between it and the effective backscatter area. The errors of determining the attenuation coefficient from measurements of the echo signal power are analyzed. A proposed method of determining that coefficient by sounding with variable pulse lengths is examined. Author

N75-16920* Scientific Translation Service, Santa Barbara, Calif.
CERTAIN PROBLEMS OF THE AUTOMATED JOINING OF RADAR METEOROLOGICAL INFORMATION **c66**
Yu. K. Fedorov and N. A. Fadeeva *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 109-113 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 144-151 (For availability see N75-16904 08-42)
CSCL 09B

The development and characteristics of a system for automatic transmission of meteorological data to U.S.S.R. weather stations are discussed. An algorithm to be used with computer storage facilities to avoid duplication of data is examined. A specific method for providing automated data transmission and reception is explained. Author

N75-16921# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 340
7 Jan. 1975 37 p refs Transl. into ENGLISH from abstracts of Sino-Soviet Bloc publications
(JPRS-63817) Avail: NTIS HC $3.75

Abstracts of articles are presented on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports. Published details of Soviet space achievements are included. Author

N75-16922# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 10, 1974
N. A. Bagrov, ed. 26 Dec. 1974 181 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 181 p
(JPRS-63748) Avail: NTIS HC $7.00

Articles are presented on microclimate, agricultural meteorology, weather forecasting, climate control, and hydrological forecasting. The activities and personnel of the Soviet Hydrometeorological Service, and new publications are also included. For individual titles, see N75-16923 through N75-16940.

N75-16923 Joint Publications Research Service, Arlington, Va.
EFFECT OF LARGE CITIES ON THE METEOROLOGICAL REGIME **c47**
Kh. P. Pogosyan *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 1-7 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 3-8 Presented at the Plenary Session of the All-Union Interdepartmental Conf. on the Climate, City and Man, Moscow, 18-22 Sep. 1973 (For availability see N75-16922 08-42)

The effect is studied of large cities on the weakening of the temperature inversion in connection with additional heating of the ground layer of the air. Author

N75-16924 Joint Publications Research Service, Arlington, Va.
PROBLEM OF PARAMETERIZING THE PROCESS OF THE TRANSFER OF RADIANT SOLAR ENERGY TO THE OCEAN-ATMOSPHERE SYSTEM AND LONG RANGE FORECASTING **c47**
Sh. A. Musayelyan *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 8-20 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 9-19 Presented at the Conf. on Long Range Weather Forecasting Tech., Moscow, 22-24 Jan. 1974 (For availability see N75-16922 08-42)

The asynchronous relations with significant time shifts (on the order of several months) between the anomalies of the total cloudiness over the North Atlantic and the ground temperature anomalies in the European territory of the U.S.S.R. were investigated. It is proposed that the conclusions drawn be used for parameterization of the large-scale nonadiabatic effects generated by the interaction processes in the ocean-atmosphere system. Some of the relations obtained can be used directly for forecasting purposes. Author

N75-16925 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF THE INTERYEAR AIR TEMPERATURE FLUCTUATIONS **c47**
N. A. Lepekhina and I. I. Polyak *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 21-28 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 20-25 (For availability see N75-16922 08-42)

A harmonic analysis of the mean annual observation data for the air temperature is performed using the longest known time series. Estimates were obtained for the spectral and correlation functions. The periodograms and the spectra in the period range from 2 to 28 years. Author

N75-16926 Joint Publications Research Service, Arlington, Va.
PERIODIC VARIATIONS OF THE WIND VELOCITY IN THE LOWER THERMOSPHERE, THE STRATOSPHERE AND THE

TROPOSPHERE IN THE WINTER c47

I. A. Lysenko, M. A. Petrosyants, Yu. I. Portnyagin, and L. V. Szetogorova *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 29-35 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 26-31 (For availability see N75-16922 08-42)

The velocity spectra is studied of the prevailing wind at altitudes of 95, 30, 25, 20, 15, 10 and 5 km for the winter of 1972/73. The general periodicities were discovered for all of the investigated levels, and the complete absence of short-period oscillations of less than 4 days in the stratosphere was detected. Author

N75-16927 Joint Publications Research Service, Arlington, Va.
VERTICAL WIND SHIFTS IN THE BOUNDARY LAYER OF THE ATMOSPHERE (ACCORDING TO EXPERIMENTAL DATA) c47

L. R. Orlenko and O. B. Shklyarevich *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 36-48 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 32-40 (For availability see N75-16922 08-42)

The effect was studied of the geostrophic wind velocity, the roughness of the underlying surface, the nature of stratification and the temperature advection on the vertical wind shifts in the lower 400-meter layer. It is demonstrated that the effect of stratification and roughness of the underlying surface is different in different layers of the lower part of the boundary layer, which confirms the necessity for more detailed consideration not only of the thickness of the layer but also its altitude above the level of the underlying surface. The basic principles of the construction of the method for calculating the vertical wind shift are discussed which permits consideration of the effect of factors. As an illustration, a nomogram is presented for determining the vertical wind shifts in the stratified boundary layer for stationary and horizontally uniform conditions. Author

N75-16928 Joint Publications Research Service, Arlington, Va.
WIND VECTOR IN THE LAYER NEXT TO THE WATER c47

Ye. K. Korchagin, R. N. Semenov, and I. A. Mandurovskiy *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 49-58 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 41-48 (For availability see N75-16922 08-42)

Results are presented of determining the horizontal component of the wind vector over the sea at different altitudes from 100 to 1000 meters using the Doppler meter for the ground speed and angle of drift, the air speed indicator and heading indicator installed on the aircraft. The parameters of the surface wind are presented defined by the aerial photographs of the sea surface from onboard the aircraft, and also calculated by the atmospheric pressure field. A comparative analysis is made of the results, and the statistical relation is established between the wind vector measured from on board the aircraft and the surface wind vector. Author

N75-16929 Joint Publications Research Service, Arlington, Va.
MICROWAVE EMISSION PROPERTIES OF WET SOIL c43

A. Ye. Popov, Ye. A. Sharkov, and V. S. Etkin *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 59-68 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 49-57 (For availability see N75-16922 08-42)

Detailed calculations were performed for the emittance and polarization coefficient of the emission of wet soil in the wave length range of 0.8-226 cm and the moisture range to 30 percent. The calculations are based on the experimental relations for the electrical parameters of the soil as a function of moisture. The limits of applicability of the approximation of tg delta much less than 1 are indicated. A study is made of the effect of the illumination of the sky on the radiobrightness temperature and the polarization coefficient of the emission of wet ground. It is demonstrated that the optimal range for measuring the moisture is the wave length range from 22 to 75 cm. A brief survey is presented of the experimental data available in the literature. Author

N75-16930 Joint Publications Research Service, Arlington, Va.
CALCULATING THE CHARACTERISTICS OF THE BOUNDARY LAYERS OF THE OCEAN AND ATMOSPHERE CONSIDERING THEIR INTEGRATION c47

Yu. D. Resnyanskiy *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 69-80 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 58-66 (For availability see N75-16922 08-42)

The seasonal variations of the thickness and the temperature of the quasiuniform layer of the ocean are calculated along with the wind velocity components, the thickness and temperature of the boundary layer of the atmosphere on the basis of the integral model. The system of equations of the model was obtained by vertical integration of the equations of motion, heat flux and turbulent energy balance within the limits of the boundary layers of the atmosphere and ocean. The latter is considered in the quasistationary approximation. The results of the numerical integration of the system of equations agree qualitatively with the observation data. An estimate is made of the effect of various parameters of the model and initial conditions on the nature of the numerical solutions obtained. Author

N75-16931 Joint Publications Research Service, Arlington, Va.
VERTICAL STRUCTURE OF THE MAIN OCEAN THERMOCLINE c48

V. S. Maderich *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 81-90 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 67-74 (For availability see N75-16922 08-42)

The vertical structure of the velocity and density fields of the main ocean thermocline was studied. The results indicate the significant dependence of the vertical density distribution on the magnitude and direction of the vertical velocity and density flow at the upper boundary of the Ekman layer. Author

N75-16932 Joint Publications Research Service, Arlington, Va.
EXCEPTIONALLY LOW WATER ON THE RIVERS OF THE EUROPEAN TERRITORY OF THE SOVIET UNION IN THE SUMMER OF 1972 c43

A. M. Vladimirov *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 91-98 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 75-80 (For availability see N75-16922 08-42)

The exceptional drought in the summer of 1972 caused a sharp decrease in runoff in the rivers in the greater part of the European territory of the U.S.S.R. Throughout the entire European territory of the U.S.S.R., a month with least runoff was established for the summer season, the magnitude of the probability of the monthly and daily minimum runoff was determined, and the regions were established in which drying up of the rivers was observed. Information is presented on the rivers with the lowest amount of water recorded in the last 50 to 80 years in the European territory of the U.S.S.R. Author

N75-16933 Joint Publications Research Service, Arlington, Va.
AGROCLIMATIC ESTIMATE OF THE SUGAR BEET PRODUCTIVITY c43

L. S. Kelchevskaya *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 99-109 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 81-88 (For availability see N75-16922 08-42)

A study is made of the theoretical principles with respect to substantiating the agroclimatic indexes for evaluating the thermal power engineering and water resources of the territory considering the fertility of the soil. A division of the European territory of the U.S.S.R. into districts by sugar beet productivity has been carried out. The potential harvest was calculated, and the remainder between the actual mean harvest and the potential harvest is found. Author

N75-16934 Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF EXPERIMENTAL STUDIES OF SMALL SCALE TURBULENCE IN THE MIDDLE TROPOSPHERE (TROPEX-72) c47

N. Z. Pinus and V. K. Dmitriyev *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 110-119 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 89-96 (For availability see N75-16922 08-42)

The results of synchronous measurements of the air temperature (T) and wind velocity (U) pulsations at altitudes of 7-8 km from onboard an aircraft are discussed. The pulsation spectra of U and T are presented for the range of wave numbers from .005 to .0005 per meter, the data on the magnitude of the dissipation rate of the turbulent energy into heat and the magnitude of the heating of the atmosphere connected with this, the equalization rates (dissipation rates) of the temperature nonuniformities and also the magnitude of the horizontal turbulent heat exchange are presented. An estimate is presented of the magnitude of the vertical turbulent heat exchange. The data on the turbulent heating of the atmosphere and the turbulent heat exchange are compared with the synchronous experimental data on the radiation heating (cooling) of the atmosphere at altitudes of 7-8 km. Author

N75-16935 Joint Publications Research Service, Arlington, Va.
CALCULATING THE WIND FIELD ABOVE THE OCEANS **c47**
L. A. Golodko and V. M. Radikevich *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 120-129 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 97-102 (For availability see N75-16922 08-42)

A procedure is presented for calculating the wind field over the oceans based on the nonlinear model of the boundary layer of the atmosphere. The input parameters are the pressure field and the air-water temperature difference. The results of the calculation are compared with the observations of the weather ship K and on the scientific research ship Professor Zubov. It is demonstrated that the mean square error in the calculation is about 1.5 m/sec and for improvement of the procedure it can be decreased to 1.0 m/sec. Some causes of the divergence between the calculation and observation results are discussed. Author

N75-16936 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF EXPERIMENTAL DATA ON THE WIND ON THE BALTIC SEA **c47**
N. A. Lavrov *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 130-133 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 102-104 (For availability see N75-16922 08-42)

Data are compared on the wind direction and velocity at the water surface in the Baltic Sea with quasistationary wind field and quasirectilinear current lines with a speed and direction of the geostrophic wind at the earth's surface. It is demonstrated that the relation between the speed and direction of the real and the geostrophic winds depends to a greater degree on the state of stability of the atmosphere and its lower layer and the velocity modulus of the geostrophic wind. Author

N75-16937 Joint Publications Research Service, Arlington, Va.
BELORUSSIAN EXPERIMENT IN CENTRALIZED AUTOMATED PROCESSING OF ATMOSPHERIC SOUNDING DATA **c60**
G. P. Trifonov, G. A. Plotnikov, and K. I. Goltsova *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 134-144 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 105-110 (For availability see N75-16922 08-42)

The results of the Belorussian experiment in the development, introduction, operation and maintenance of the system for centralized automated processing of atmospheric radio sounding data in the network of aerological statements of the Belorussian administration of the Hydrometeorological Service at Minsk, Brest and Gomel' in 1970-1972 are described: the results are summed up and the prospects for further development of the automation of atmospheric radio sounding data processing are noted. Author

N75-16938 Joint Publications Research Service, Arlington, Va.
STUDY OF THE EARTH'S NATURAL RESOURCES BY THE SPACE SURVEY METHODS (SURVEY OF PROJECTS IN 1973) **c43**
Yu. F. Knizhnikov and V. I. Kravtsova *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 145-155 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 111-116 (For availability see N75-16922 08-42)

The earth surveys conducted during the Soyuz 12 and Soyuz 13 space flights are discussed. The operations performed with respect to the survey and studies with respect to the application of the survey results to study the earth's resources are examined. The relationship to the Earth Resources Technology Satellite observations is noted. The remote sensors used in the surveys and the data reduction techniques are reported. Author

N75-16939 Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL CONDITIONS ON THE INTERNATIONAL AIR LANES **c47**
V. M. Kosenko *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 156-157 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 117-119 (For availability see N75-16922 08-42)

A meteorological survey of conditions existing along established air lanes in Russia was conducted to determine the safety of air transportation. The analyses consist of a physical-geographic characteristic investigation of the region, the atmospheric processes causing the complex meteorological situation of the flight, and the annual and spatial distribution of the meteorological elements in the different layers of the troposphere and the lower stratosphere. The flight conditions are characterized for the 300 millibar level and for the 50 millibar level which is proposed for supersonic transport aircraft. Author

N75-16940 Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL FACTORS OF THE THERMAL REGIME OF BUILDINGS **c39**
I. A. Kazantsev *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 158-160 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 118-119 (For availability see N75-16922 08-42)

A survey was conducted to determine the effects of meteorological factors on building design and the thermal protection of buildings. The basic principles of the theory of the thermal regime of buildings are discussed with respect to the effect of the conductive-infiltration and radiation heat exchange. A study was made of the problems of the effect of the solar radiation on the thermal regime of buildings. The three basic factors of air temperature, the wind, and solar radiation are analyzed to provide a distribution law of the heating norms with respect to the territory involved. Author

N75-16941*# Kanner (Leo) Associates, Redwood City, Calif.
SIZE OF SAND GRAIN AND CRITICAL WIND VELOCITY AT WHICH SANDS GRAINS BEGIN TO MOVE (CONTINUED)
M. Akiba Washington NASA Feb. 1975 15 p refs Transl. into ENGLISH from J. Agr. Eng. Soc., Jap. (Japan), v. 6, no. 1, 1934 p 53-60
(Contract NASw-2481)
(NASA-TT-F-16190) Avail: NTIS HC $3.25 CSCL 04B

Theoretical and experimental calculations on the effect of sand grain size and wind velocity on sand movement are discussed. There is good agreement. The velocity of natural wind and the effect of an increase in air density due to increase humidity are also taken into account. Author

N75-16942# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 341
22 Jan. 1975 49 p Transl. into ENGLISH from Russian reports
(JPRS-63927) Avail: NTIS HC $3.75

Translations and abstracts of articles are presented on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, with both science news and formal scientific reports. Published details of Soviet space spectaculars are included. Author

N75-16943# Oak Ridge National Lab., Tenn.
USER'S MANUAL FOR THE FORTRAN 4 VERSION OF THE WISCONSIN HYDROLOGIC TRANSPORT MODEL
M. R. Patterson, J. K. Munro, D. E. Fields, D. E. Ellison, Aj A. Brooks, and D. D. Huff Oct. 1974 258 p refs
(Contract W-7405-eng-26)

(ORNL-NSF-EATC-7) Avail: NTIS HC $8.50

A user's guide for the Wisconsin Hydrologic Transport Model (WHTM) is presented to enable the simulation of trace contaminant transport by the hydrologic cycle. The model is based on the Stanford Watershed Model and forms a major component of the Unified Transport Model being developed at ORNL. WHTM includes the hydrologic transport of a trace contaminant by entrainment in overland flow, infiltration, impervious area runoff, and base flow. Chemical exchange reactions are simulated with a simple ion-exchange submodel for interaction with the soil and a sheet erosion submodel for transport of the trace contaminant that is sorbed on the surface of eroded soil particles. Detailed instructions for the application of the WHTM are given, and lists of the FORTRAN source decks and sample input data are provided. Simulation of the hourly flow in seven reaches of a stream channel system for a period of one year can be done on the IBM System 360/91 computer in about four minutes.

Author (NSA)

N75-16944# Washington Univ., Seattle. Arctic Ice Dynamics Joint Experiment Office.

[MONITORING SEA ICE MOVEMENT, FORMATION, AND DEFORMATION] AIDJEX Bulletin Number 26

Sep. 1974 206 p refs

(Contract NSF C-625)

(PB-236665/6; AIDJEX-74-26) Avail: NTIS HC $7.25 CSCL 08L

AIDJEX Bulletin No. 26 contains a summary of the program and progress of AIDJEX since its organization in 1970. A logistics report from the AIDJEX Lead Experiment, which was carried out in spring 1974, is also included. Two articles describe results obtained from the 1972 AIDJEX pilot study: One deals with ocean current observations at the main camp; and the other with surface atmospheric pressure fields computed from pilot study data and National Weather Service data. Other articles deal with ice deformation obtained from satellite imagery and with further progress in numerical modeling of sea ice. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N75-16945 British Library Lending Div., Boston Spa (England).

THE HEALTH OF THE PLANET

L. Yefremov [1974] 5 p Transl. into ENGLISH from the Russian

(BLL-M-23519-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The protection of the environment and the rational utilization of natural resources are discussed for the Soviet Union. The prevention of water and air pollution, and protective measures for the prevention of soil erosion are also discussed. F.O.S.

N75-16946 British Library Lending Div., Boston Spa (England).

WATER TEMPERATURE AND GEOLOGICAL FORECAST

V. Saks [1974] 3 p Transl. into ENGLISH from the Russian (BLL-M-23512-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The dependence between sea water temperature and O18 absorption by extinct marine organisms was used to determine the average annual sea water temperatures in seas that covered parts of Siberia about 100 to 150 million years ago. The obtained result of 15 to 20 C indicates the existence of all necessary conditions for the formation of oil and gas in the Siberian north, including the bottom of the Arctic Sea. G.G.

N75-16947 British Library Lending Div., Boston Spa (England).

THE PROSE OF COOPERATION

8 Apr. 1974 6 p Transl. into ENGLISH from the Russian

(BLL-M-23499-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A question and answer dialog concerning scientific research priorities is presented from a meeting of the U.S.S.R.-U.S. Joint Commission for Scientific and Technical Cooperation. N.E.R.

N75-16948*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

STATISTICS OF Ku-BAND MICROWAVE RESPONSE OF THE UNITED STATES WITH A SATELLITE BORNE RADIOMETER/SCATTEROMETER Advance Report of Significant Results

R. K. Moore, Principal Investigator, F. T. Ulaby, A. Sobti, and T. Burton Oct. 1974 11 p EREP

(Contract NAS9-13331)

(E75-10129; NASA-CR-142049) Avail: NTIS HC $3.25 CSCL 05B

The author has identified the following significant results. The Skylab S-193 radiometer/scatterometer collected thousands of measurements of scattering coefficient and brightness temperature over various parts of the United States during the summer of 1973 at angles of incidence between vertical and about 45 deg. These measurements have been combined to produce histograms of the response at each of several angles within this range, and to establish average scattering coefficient vs angle curves with 10% and 90% exceedance levels as well. The variation of the radiometric measurements is primarily in the region from 255 K to 285 K, with very few measurements giving higher values, but a significant, though small, number giving values down to and even below 200 K. The scattering coefficient varies, for the mean, from about 0 db at 1 deg off vertical to a low in the neighborhood of -10 db at 45 deg. The variability of the scattering coefficient measurements with this coarse resolution sensor is surprisingly small. The number of distinguishable levels is slightly more for the scatterometer than for the radiometer, but the amount of variation in brightness temperature caused by the physical temperature of the ground is enough so that the scatterometer can be used to distinguish significantly more meaningful levels than the radiometer.

N75-16949*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

DESIGN DATA COLLECTION WITH SKYLAB/EREP MICROWAVE INSTRUMENT S-193 Monthly Letter Progress Report No. 14, Nov. 1974

R. K. Moore, Principal Investigator and Arun Sobti Nov. 1974 3 p EREP

(Contract NAS9-13331)

(E75-10130; NASA-CR-142050) Avail: NTIS HC $3.25 CSCL 09D

There are no author-identified significant results in this report.

N75-16950*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

SOIL MOISTURE DETECTION BY SKYLAB'S MICROWAVE SENSORS Advance Report of Significant Results

R. K. Moore, Fawwaz T. Ulaby, Principal Investigators, John Barr, and Arun Sobti Oct. 1974 6 p refs EREP

(Contract NAS9-13331)

(E75-10131; NASA-CR-142051) Avail: NTIS HC $3.25 CSCL 08H

The author has identified the following significant results. Terrain microwave backscatter and emission response to soil moisture variations were investigated using Skylab's 13.9 GHz RADSCAT (radiometer/scatterometer) system. Data acquired on June 5, 1973, over a test site in west-central Texas indicated a fair degree of correlation with composite rainfall. The scan made was cross-track contiguous (CTC) with a pitch of 29.4 deg and no roll effect. Vertical polarization was employed with both radiometer and scatterometer. The composite rainfall was computed according to the flood prediction technique using rainfall data supplied by weather reporting stations.

N75-16951*# Consiglio Nazionale delle Ricerche, Milan (Italy).

FRACTURES AND LINEAMENTS OF SICILY ISLAND: PRELIMINARY RESULTS ON ANALOG OPTICAL TECHNIQUES Progress Report

Roberto Cassinis, Principal Investigator and A. M. Tonelli 6 Dec. 1974 7 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP

(E75-10132; NASA-CR-142052; PR-5) Avail: NTIS

HC $3.25 CSCL 08E
There are no author-identified significant results in this report.

N75-16952*# Environmental Research and Technology, Inc., Lexington, Mass.
EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB Quarterly Progress Report, Nov. 1974 - Jan. 1975
David T. Chang, Principal Investigator Jan. 1975 2 p EREP
(Contract NAS9-13343)
(E75-10133; NASA-CR-142053; QPR-7) Avail: NTIS HC $3.25 CSCL 04A
There are no author-identified significant results in this report.

N75-16953*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Monthly Progress Report, 30 Jun. 1974 - 30 Jan. 1975
K. J. Savastano, Principal Investigator 10 Feb. 1975 5 p EREP
(NASA Order T-8217-B)
(E75-10134; NASA-CR-142054; MPR-14) Avail: NTIS HC $3.25 CSCL 08A
There are no author-identified significant results in this report.

N75-16954*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Jan. 1975
David S. Gilmer, Principal Investigator Jan. 1975 3 p EREP
(NASA Order T-4114-B)
(E75-10135; NASA-CR-142055) Avail: NTIS HC $3.25 CSCL 06C
There are no author-identified significant results in this report.

N75-16955*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Dec. 1974
Allan Shapiro, Principal Investigator 10 Feb. 1975 1 p EREP
(NASA Order T-4716-B)
(E75-10136; NASA-CR-142064) Avail: NTIS HC $3.25 CSCL 08E
There are no author-identified significant results in this report.

N75-16956*# Environmental Research Inst. of Michigan, Ann Arbor.
A SKYLAB PROGRAM FOR THE INTERNATIONAL HYDROLOGICAL DECADE (IHD) Quarterly Report, Sep. - Nov. 1974
Fabian C. Polcyn, Principal Investigator and Diana L. Rebel 10 Feb. 1975 4 p EREP
(Contract NAS9-13275)
(E75-10137; NASA-CR-142063; ERIM-102300-15-L) Avail: NTIS HC $3.25 CSCL 08H
The author has identified the following significant results. Demonstration of the procedure for utilizing the model relating red and IR reflectance to surface soil moisture over regions of variable vegetation cover indicates that remote sensing may be able to make direct inputs into determination of this hydrologic parameter.

N75-16957*# Smithsonian Institution, Washington, D.C. Chesapeake Bay Center for Environmental Studies.
INVESTIGATIONS ON CLASSIFICATION CATEGORIES FOR WETLANDS OF CHESAPEAKE BAY USING REMOTELY SENSED DATA Annual Report, 10 Oct. 1972 - 9 Oct. 1973
Francis S. L. Williamson Dec. 1974 98 p refs
(Contract NAS6-1913)
(NASA-CR-137479) Avail: NTIS HC $4.75 CSCL 08B
The use of remote sensors to determine the characteristics of the wetlands of the Chesapeake Bay and surrounding areas is discussed. The objectives of the program are stated as follows: (1) to use data and remote sensing techniques developed from studies of Rhode River, West River, and South River salt marshes to develop a wetland classification scheme useful in other regions of the Chesapeake Bay and to evaluate the classification system with respect to vegetation types, marsh physiography, man-induced perturbation, and salinity; and (2) to develop a program using remote sensing techniques, for the extension of the classification to Chesapeake Bay salt marshes and to coordinate this program with the goals of the Chesapeake Research Consortium and the states of Maryland and Virginia. Maps of the Chesapeake Bay areas are developed from aerial photographs to display the wetland structure and vegetation. Author

N75-16958*# Lockheed Electronics Co., Houston, Tex.
MULTISPECTRAL SCANNER DATA PROCESSING OVER SAM HOUSTON NATIONAL FOREST Progress Report
C. A. Reeves and E. P. Kan Dec. 1974 15 p refs
(Contract NAS9-12200)
(NASA-CR-141610; LEC-5265) Avail: NTIS HC $3.25 CSCL 02F
The Edit 9 forest scene, a computer processing technique, and its capability to map timber types in the Sam Houston National Forest, are evaluated. Special efforts were made to evaluate existing computer processing techniques in mapping timber types using ERTS-1 and aircraft data, and to provide an opportunity to open up new research and development areas in forestry data. Author

N75-16959*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
INTERPRETATION OF REMOTE SENSING DATA IN THE BAYOU LAFOURCHE DELTA OF SOUTH LOUISIANA Annual Report, Feb. 1974 - Feb. 1975
Charles A. Whitehurst 28 Feb. 1975 23 p refs
(Grant NGL-19-001-105)
(NASA-CR-141233) Avail: NTIS HC $3.25 CSCL 08F
Initial efforts were directed toward a comprehensive ground truth program for the Bayou Lafourche Delta. The impact of transportation systems on the marsh environment, impounded marsh areas, proposed jetty systems at Belle Pass, Louisiana, and erosion and sediment transport in the southwestern canal, Lafourche Parish, Louisiana are studied. The use of color IR imagery for a vegetation study of spoil banks in the Bayou Lafourche Region is also discussed. J.A.M.

N75-16960*# Texas Instruments, Inc., Dallas.
INFRARED INTERFEROMETER SPECTROMETER AND RADIOMETER (IRIS) INSTRUMENT FOR MARINER/JUPITER/SATURN 1977 (MJS'77) Quarterly Report, 12 Jul. - 12 Oct. 1974
D. D. Vanous Oct. 1974 217 p refs
(Contract NAS5-20498)
(NASA-CR-143677; U2-863919-1; QR-2) Avail: NTIS HC $7.25 CSCL 14B
The development and characteristics of the infrared interferometer spectrometer and radiometer (IRIS) instrument for use with the Mariner/Jupiter/Saturn space probe. The subjects discussed are: (1) the electronic design, (2) the opto-mechanical design, (3) reliability analysis, (4) quality control, and (5) program management. Author

N75-16961*# Mathematica, Inc., Princeton, N.J.
PRINCIPLES OF COST-BENEFIT ANALYSIS FOR ERTS EXPERIMENTS, VOLUMES 1 AND 2
31 Aug. 1973 134 p refs Sponsored by NASA
(NASA-CR-141225) Avail: NTIS HC $5.75 CSCL 05C
The basic elements of a cost-benefit study are discussed along with special considerations for ERTS experiments. Elements required for a complete economic analysis of ERTS are considered to be: statement of objectives, specification of assumptions, enumeration of system alternatives, benefit analysis, cost analysis nonefficiency considerations, and final system selection. A hypothetical cost-benefit example is presented with the assumed objective of an increase in remote sensing surveys of grazing lands to better utilize available forage to lower meat prices.
F.O.S.

N75-16962# Los Alamos Scientific Lab., N.Mex.
GEOTHERMAL WELL TECHNOLOGY AND POTENTIAL APPLICATIONS OF SUBTERRENE DEVICES: A STATUS REVIEW
J. H. Altseimer Jul. 1974 34 p refs
(Contract W-7405-eng-36)
(LA-5689-MS) Avail: NTIS HC $3.75

The past, present, and some future aspects of the geothermal energy industry have been reviewed with special attention given to geothermal well drilling problems. Short term improvements are needed in drilling rigs and auxiliary surface equipment, drill bits, bit bearing lubrication systems, tubular goods, high temperature muds and cements, logging and downhole sampling equipment, directional control equipment applicable to geothermal conditions, and in the use of a data bank for GTE wells to help optimize drilling programs. Two types of wells are needed: (1) small diameter wells for exploration, reinjection, and disposal purposes; and (2) larger diameter wells for production. Concepts for penetrating rocks by use of rock melting processes offer potential solutions to some difficult GTE well production problems. Author (NSA)

N75-16963# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
THE REMOTE IDENTIFICATION OF TERRAIN FEATURES AND MATERIALS AT A VIRGINIA TEST SITE: AN INVESTIGATIVE STUDY OF MULTISPECTRAL SENSING TECHNIQUES Interim Report, Apr. 1970 - Dec. 1972
Thomas W. Wagner and Philip G. Hasell, Jr. Jan. 1974 75 p refs
(Contract DOT-FH-11-7136)
(PB-236513/8; ERIM-196200-7-T; FHWA-RD-74-10) Avail: NTIS HC $4.25 CSCL 14E

This report documents the collection, processing, and analysis of multispectral remote sensor data from a 2-by 13-mile study site in Augusta County, Virginia. The objectives of this study were to develop and test, using analog processing facilities, techniques for the identification and automatic discrimination of selected terrain features and natural materials. Aircraft data were collected in up to 15 spectra bands at two times of the day during two different seasons. A ratio image-enhancement procedure and multi-object discrimination techniques were tested. Each of these techniques is described and the results illustrated. GRA

N75-16964# Geological Survey, Reston, Va.
PRINCIPAL FACTS FOR GRAVITY STATIONS IN THE NORTHERN SLATE BELT OF SOUTH CAROLINA
Peter Popenoe 1974 41 p ref
(PB-236655/7; USGS-GD-74-037) Avail: NTIS HC $3.75 CSCL 08E

Observed gravity values, station locations, and Bouguer gravity data are presented in tabular form for 1185 gravity stations at 1 to 2 km station spacing covering an area of the Carolina Slate Belt in north-central South Carolina. Data cover the area from 80 deg. 15 min. to 81 deg. 00 min. longitude and 34 deg. 15 min. to 34 deg. 52 min. 30 sec. latitude in South Carolina. Simple Bouguer reductions were made for densities of 2.67 and 2.74 gms/cc. Also included is a description of format terms and a discussion on base tie and elevation and location accuracies. GRA

N75-16965*# Bureau of Mines, Twin Cities, Minn. Mining Research Center.
THERMAL DIFFUSIVITY OF SIX IGNEOUS ROCKS AT ELEVATED TEMPERATURES AND REDUCED PRESSURES Report of Investigations
D. P. Lindroth Sep. 1974 38 p refs
(Grant NGR-09-040-001)
(NASA-CR-142083; PB-237030/2; BM-RI-7954) Avail: NTIS HC $3.75 CSCL 08G

The thermal diffusivity above 298 K, up to 400 K and at pressures from ambient down to 10 to the minus tenth power torr was measured for the following six igneous rock types: tholeiitic basalt, obsidian, rhyolite, granodiorite, gabbro, and dunite. The thermal diffusivity data were obtained by the laser flash method. Data are also included on a commercial fused silica, which was used as a standard. GRA

N75-16966# National Committee for the International Hydrological Decade, Washington, D.C.
INTERNATIONAL HYDROLOGICAL DECADE REPRESENTATIVE AND EXPERIMENTAL BASINS IN THE UNITED STATES: CATALOG OF AVAILABLE DATA AND RESULTS 1965-1972
Jul. 1974 160 p
(Grant NSF C-310)
(PB-237002/1; NAS/IHD-74/01) Avail: NTIS HC $6.25 CSCL 08H

The catalog describes briefly the data collected in studies of the 60 International Hydrological Decade representative and experimental basins in the United States and lists the main results of the hydrological studies undertaken in those basins within the framework of, and as contributions to, the Decade. The report emphasizes: (1) the objectives of studies in each area; (2) the significant results of the studies in each area; and (3) the data that are now available for exchange. There is a section on Reports Available Publicly for each basin listed. GRA

N75-16929 Joint Publications Research Service, Arlington, Va.
MICROWAVE EMISSION PROPERTIES OF WET SOIL
A. Ye. Popov, Ye. A. Sharkov, and V. S. Etkin *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 59-68 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 49-57 (For availability see N75-16922 08-42)

N75-16932 Joint Publications Research Service, Arlington, Va.
EXCEPTIONALLY LOW WATER ON THE RIVERS OF THE EUROPEAN TERRITORY OF THE SOVIET UNION IN THE SUMMER OF 1972
A. M. Vladimirov *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 91-98 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 75-80 (For availability see N75-16922 08-42)

N75-16933 Joint Publications Research Service, Arlington, Va.
AGROCLIMATIC ESTIMATE OF THE SUGAR BEET PRODUCTIVITY
L. S. Kelchevskaya *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 99-109 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 81-88 (For availability see N75-16922 08-42)

N75-16938 Joint Publications Research Service, Arlington, Va.
STUDY OF THE EARTH'S NATURAL RESOURCES BY THE SPACE SURVEY METHODS (SURVEY OF PROJECTS IN 1973)
Yu. F. Knizhnikov and V. I. Kravtsova *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 145-155 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 111-116 (For availability see N75-16922 08-42)

N75-17207* General Electric Co., Philadelphia, Pa.
IMAGE DATA PROCESSING OF EARTH RESOURCES MANAGEMENT
A. W. DeSio *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 201-218 (For availability see N75-17188 08-80)
CSCL 08G

N75-17208* Rice Center for Community Design and Research, Houston, Tex.
THE APPLICATION OF NATURAL SCIENCE DATA TO LAND MANAGEMENT DECISION-MAKING
Donald L. Williams, Carl P. Sharpe, and Peter G. Rowe *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 219-228 refs (For availability see N75-17188 08-80)
CSCL 08B

N75-17211* TRW Systems Group, Redondo Beach, Calif.
APPLICATION OF ADVANCED SIGNAL PROCESSING TECHNIQUES TO THE RECTIFICATION AND REGISTRATION OF SPACEBORNE IMAGERY
R. H. Caron, S. S. Rifman, and K. W. Simon *In* Chamber of

Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 245-255 refs (For availability see N75-17188 08-80) CSCL 08G

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-16967 British Library Lending Div., Boston Spa (England).
LEAD ACCUMULATOR BATTERIES IN TELECOMMUNICATIONS
R. Colin Jun. 1974 39 p Transl. into ENGLISH from Commutation et Electronique (France), no. 37, Apr. 1972 p 25-44
(BLL-Trans-2943-(9022.81)) Avail: British Library Lending Div., Engl.: 4 BLL photocopy coupons

The principles of the theory and the techniques of electric accumulators are described along with this application in the field of telecommunications. Author

N75-16968 British Library Lending Div., Boston Spa (England).
ENERGY FROM THE EARTH'S DEPTHS
A. Blokhnin [1974] 4 p Transl. into ENGLISH from the Russian
(BLL-M-23516-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Underground pumped-storage schemes are discussed as a possible auxiliary energy supply for peak-load consumption. The working principles are summarized, with some of the technical and engineering considerations in its construction. N.E.R.

N75-16969 British Library Lending Div., Boston Spa (England).
DRY OIL
[1974] 3 p Transl. into ENGLISH from the Russian
(BLL-M-23508-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A new oil dewatering technique is reported that introduces the chemical demulsification agent directly into the well as well as into the pipeline for the highest effectiveness. This combined scheme of oil preparation produces an excellent oil at great economic savings. G.G.

N75-16970# Electricity Council, London (England).
AIR CONDITIONING OF OFFICE BUILDINGS WITH ALL-ELECTRIC SUPPLY. PART 1: TECHNICAL CONCEPTION
M. Kuhn and H. Vicktor 1974 18 p Transl. into ENGLISH from Heizung-Lueftung-Haustech. (Duesseldorf), v. 25, no. 4, Apr. 1974 p 109-112
(OA-Trans-938-Pt-1) Avail: NTIS HC $3.25

A energy concept is developed, which is initially based on the model of an office building with all-electric supply. The principles and the technical conception are discussed, along with economic considerations relating to all-electric air conditioning. Cost comparisons are made with other energy sources, and the heating and cooling load is calculated. Author

N75-16971# Delaware Univ., Newark. Inst. of Energy Conversion.
TECHNIQUES FOR THE DETERMINATION OF THE PHASES IN THE SURFACE LAYERS OF CdS/Cu2S CELLS
Irwin G. Greenfield and Wen F. Tseng Dec. 1973 16 p refs (Grant NSF GI-34872)
(NSF/RANN/SE/GI34872/TR/73/15) Avail: NTIS HC $3.25

A combination of methods is used to determine the reaction products in the near surface layers of the cadmium sulfide cell. The importance of chalcocite for good yield in the cells is studied by the employment of scanning electron microscopy, Auger spectrography, transmission electron microscopy and selected area diffraction. Author

N75-16972*# National Aeronautics and Space Administration. Pasadena Office, Calif.
LOW TO HIGH TEMPERATURE ENERGY CONVERSION SYSTEM Patent Application
Charles G. Miller, inventor (to NASA) (JPL) Filed 27 Dec. 1974 24 p
(Contract NAS7-100)
(NASA-Case-NPO-13510-1; US-Patent-Appl-SN-536786) Avail: NTIS HC $3.25 CSCL 10A

A low to high temperature energy conversion system is described which includes a decomposition chamber in which ammonia (NH3) is decomposed into hydrogen and nitrogen by absorbing heat of decomposition from a low temperature (300 C) energy source. The separated hydrogen and nitrogen are then supplied to a recombination chamber where they recombine to produce ammonia. The recombination process is associated with a significant increase in temperature, used to increase the temperature of a fluid to temperatures on the order of 550 C. NASA

N75-16973# Committee on Commerce (U. S. Senate).
DEVELOPMENT OF OIL AND GAS ON THE CONTINENTAL SHELF
George A. Doumani and Norma W. Dyas Washington GPO 1974 16 p refs Rept. presented to Comm. on Commerce pursuant to S. Res. 222, 93d Congr., 2d Sess., 18 Apr. 1974 Prepared by the Library of Congr., Sci. Policy Res. Div.
(GPO-31-891) Avail: Comm. on Commerce

The possibilities and risks involved in offshore drilling for oil and gas are summarized, with legal and jurisdictional problems and environmental and land use issues included. Relevant legislation is outlined. N.E.R.

N75-16974*# Grumman Aerospace Corp., Bethpage, N.Y.
DESIGN AND TEST OF A 100 AMPERE-HOUR NICKEL CADMIUM BATTERY MODULE
S. Gaston, M. Wertheim, F. S. Burgess, D. Lehrfeld, and A. Winegard Mar. 1973 192 p
(Contract NAS9-11074)
(NASA-CR-141600) Avail: NTIS HC $7.00 CSCL 10A

A feasibility study was conducted on the design and construction of a flight-worthy replaceable battery module consisting of four 100 A.H. nickel-cadmium rechargeable cells for large manned space vehicles. The module is planned to weigh less than 43 pounds and be fully maintainable in a zero-g environment by one man without use of special tools. An active environmental control system was designed for the temperature control of the module. Author

N75-16975# Comptroller General of the United States, Washington, D.C.
PROGRESS AND PROBLEMS IN DEVELOPING NUCLEAR AND OTHER EXPERIMENTAL TECHNIQUES FOR RECOVERING NATURAL GAS IN THE ROCKY MOUNTAIN AREA
2 Apr. 1974 86 p
(B-164105) Avail: NTIS HC $4.75

Economic, technical, and environmental aspects of methods for recovering natural gas in the Rocky Mountains are discussed. The three techniques covered include nuclear stimulation, massive hydraulic fracturing, and chemical explosive techniques. Factors which would have an impact on the cost of development with these methods are evaluated, and potential problems are defined. N.E.R.

N75-16976*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GSFC BATTERY WORKSHOP
Nov. 1974 365 p Presented at the Ann. Battery Workshop, Greenbelt, Md. 19-20 Nov. 1974
(NASA-TM-X-70822; X-711-74-348) Avail: NTIS HC $10.00 CSCL 10C

The proceedings of a conference on electric storage batteries are presented. The subjects discussed include the following: (1) a low cost/standardization program, (2) test and flight experience, (3) materials and cell components, and (4) new developments

in the nickel/hydrogen system. The application of selected batteries in specific space vehicles is examined. Author

N75-16977# Advisory Group for Aerospace Research and Development, Paris (France).
THE 1974 AGARD ANNUAL MEETING: THE ENERGY PROBLEM: IMPACTS ON MILITARY RESEARCH AND DEVELOPMENT
Dec. 1974 84 p refs In ENGLISH and partly in FRENCH Meeting held at Paris, 26 Sep. 1974
Avail: NTIS HC $4.75

The proceedings of a conference on the impact of the energy problem on military research and development projects are presented. Some of the subjects discussed are as follows: (1) energy problems in a global context, (2) energy related research and development in the U.S. Air Force, (3) alternate fuels for aviation purposes, (4) the impact of future fuels on military aircraft engines, and (5) energy resources and utilization. For individual titles, see N75-16978 through N75-16983.

N75-16978 Ministry of Defence, Paris (France).
ENERGY PROBLEMS IN A GLOBAL CONTEXT
Jacques-emile Dubois *In* AGARD The 1974 AGARD Ann. Meeting Dec. 1974 p 6-20 refs In ENGLISH and FRENCH (For availability see N75-16977 08-44)

An analysis of the world-wide problems created by the consumption of non-renewable sources of energy is presented. The energy system of an industrial society is described by a diagram. A correlation between the energy consumption per individual of a given country and the gross national product of the company is developed. A chart of prospective sources of energy to meet future requirements is provided. Methods for obtaining additional energy by methods which do not consume fossil fuels are explained. The characteristics of an energy system based on the use of hydrogen as the primary energy sources are defined. Author

N75-16979 Air Force Dept., Washington, D.C.
ENERGY-RELATED RESEARCH AND DEVELOPMENT IN THE UNITED STATES AIR FORCE
Michael I. Yarymovych *In* AGARD The 1974 AGARD Ann. Meeting Dec. 1974 p 21-30 (For availability see N75-16977 08-44)

The requirements for petroleum based energy sources by the Department of Defense of the United States are analyzed. In addition to the requirements of the military forces, the logistic requirements are also examined. The impact of the energy crisis on military research and development programs to develop new energy sources for military use is examined. Methods of reducing fuel consumption by aircraft design and structural modification are proposed. The effectiveness of a campaign to reduce energy requirements and expenditures is documented. Author

N75-16980 Pinkel (I. Irving), Fairview Park, Ohio.
ALTERNATIVE FUELS FOR AVIATION
I. Irving Pinkel *In* AGARD The 1974 AGARD Ann. Meeting Dec. 1974 p 31-36 (For availability see N75-16977 08-44) CSCL 21D

The status of energy programs to provide hydrocarbon fuels from new sources is examined. Experience in the United States with non-hydrocarbon fuels for turbine powered aircraft is analyzed. The various alternate sources of hydrocarbon fuels are defined. The use of metals and metal slurries as turbine fuels is proposed. The advantages and disadvantages of liquid hydrogen as an aircraft fuel are discussed. A specific example of an aircraft operating on liquid hydrogen is described. Author

N75-16981 National Aerospace Lab., Amsterdam (Netherlands).
IMPACT OF FUTURE FUELS ON MILITARY AERO-ENGINES
F. Jaarsma *In* AGARD The 1974 AGARD Ann. Meeting Dec. 1974 p 37-46 refs (For availability see N75-16977 08-44)

The expected impact of the fossil fuel shortage on the design and operation of aircraft engines is discussed. Alternate fuels such as cryogenic fluids and synthetic fuels are proposed. Various aspects related to combustion of cryogenic and synthetic fuels are analyzed to examine the effects on seals, pumps, contamination, and engine operating procedures. Author

N75-16982 Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
IMPACT ON AERODYNAMIC DESIGN
X. Hafer *In* AGARD The 1974 AGARD Ann. Meeting Dec. 1974 p 47-55 refs (For availability see N75-16977 08-44)

The impact of fossil fuel consumption and anticipated shortages on aircraft design for improved efficiency is examined. Aerodynamic possibilities for improved efficiency are as follows: (1) aerodynamic configuration optimization, (2) boundary layer suction, (3) the oblique wing, and (4) supercritical airfoils. Aerodynamic improvements using active controls are as follows: (1) relaxed static stability, (2) maneuver load control, (3) active flutter control, and (4) gust alleviation and fatigue damage control. Changes in aircraft aerodynamics design resulting from the use of hydrogen fuel are analyzed. Author

N75-16983 National Gas Turbine Establishment, Pyestock (England).
ENERGY RESOURCES AND UTILIZATION
M. C. Neale *In* AGARD The 1974 AGARD Ann. Meeting Dec. 1974 p 56-66 refs (For availability see N75-16977 08-44)

An analysis of the world situation with respect to fossil fuels is presented. The impact of the fuel shortage on military aviation in European countries is examined. The availability and utilization of fuels other than petroleum are discussed. Charts are developed to show the following conditions: (1) world crude oil production and proven reserves, (2) world energy production and consumption, (3) total energy consumption per capita for the major nations, (4) outlets for refinery products, and (5) estimated coal reserves. Author

N75-16984# Argonne National Lab., Ill. Chemical Engineering Div.
HIGH ENERGY BATTERY PROGRAM AT ARGONNE NATIONAL LABORATORY
P. A. Nelson and D. S. Webster Apr. 1974 24 p refs
(Contract W-31-109-eng-38)
(ANL-8064) Avail: NTIS HC $3.25

Electrically rechargeable lithium/sulfur batteries are being developed for use as energy-storage devices for electric utility networks and as power sources for electric automobiles. The objectives of the program, to be completed by 1980, are to install a 1-MW battery in a demonstration facility at an electric utility substation and to install in a test vehicle, a car battery that was built by a commercial subcontractor. Recent work has indicated that high temperature cells having negative electrodes of a lithium-aluminum alloy, a molten salt electrolyte of LiCl-KCl (mp, 352 C), and positive electrodes of iron sulfide show promise of meeting the requirements of batteries both for off-peak energy storage and for electric automobiles. In a test of a full-scale Li-Al/LiCl-KCl/FeS2 cell, a maximum specific energy of 121 W-hr/kg was attained and, in 41 cycles over a period of 1390 hr, the specific energy was 65-100 W-hr/kg. Studies of small scale cells with FeS electrodes indicate that FeS is also a promising electrode material. Author (NSA)

N75-16985# Aerojet Nuclear Co., Idaho Falls, Idaho.
IDAHO GEOTHERMAL R AND D PROJECT REPORT FOR PERIOD 16 DECEMBER 1973 - 15 MARCH 1974
J. F. Kunze and L. G. Miller 18 Mar. 1974 41 p
(Contract AT(10-1)-1375)
(ANCR-1155) Avail: NTIS HC $3.75

The Idaho Geothermal R and D Project was initially charted by the Division of Applied Technology in December 1973. This report covers the first three months of activity. A brief summary is given in section 2, with more detailed discussions in subsequent sections. Author (NSA)

N75-16986# Sandia Labs., Albuquerque, N.Mex.
DESIGN ANALYSIS OF ASYMMETRIC SOLAR RECEIVERS
W. H. McCulloch and G. W. Treadwell Aug. 1974 23 p refs
(Contract AT(29-1)-789)
(SAND-74-0124) Avail: NTIS HC $3.25

One of the primary distinctions among parabolic cylinder solar collectors is the focal length of the reflector. For a given collector width, this focal length is directly related to the rim angle. This study considers in detail the effects of varying the

receiver design with focal length. As the rim angle is decreased, an increasing portion of the receiver and its envelope receives little or no reflected solar flux, and this portion may be designed to minimize thermal losses. The result is a design which is not symmetric about the receiver axis. The purpose of this analysis is to examine the performance of such an asymmetric receiver design and to determine the optimum rim angle. The results of the study show that, for the receiver configuration and operational conditions described, the optimum receiver has a 90 deg rim angle. The impact of varying a number of design parameters is also evaluated. Author (NSA)

N75-16987# Sandia Labs., Albuquerque, N.Mex.
PRELIMINARY STUDY INTO THE FEASIBILITY OF A SIXTY MINUTE THERMAL BATTERY
D. M. Bush and A. R. Baldwin Jul. 1974 14 p refs
(Contract AT(29-1)-789)
(SLA-73-0412A) Avail: NTIS HC $3.25

To investigate the feasibility of a long life thermal battery, units were assembled with depolarizer-electrolyte-binder pellets developed especially for low current density discharge. The battery configuration was essentially that of the 2748, which has demonstrated a thermal life exceeding 60 minutes. Fourteen batteries were tested, and the results clearly demonstrated the possibility of developing thermal batteries for life requirements in the 45- to 60-minute range. Author (NSA)

N75-16988# Sandia Labs., Albuquerque, N.Mex.
DEVELOPMENT AND PERFORMANCE OF A MINIATURE, HIGH-VOLTAGE THERMAL BATTERY
R. P. Clark and E. V. Forsman 1974 6 p refs Presented at 9th Intersociety Energy Conversion Eng. Conf., San Francisco, 26 Aug. 1974 Sponsored by AEC
(SLA-74-5363; Conf-740805-5) Avail: NTIS HC $3.25

A miniature, high-voltage, thermally activated battery was developed at Sandia Laboratories. This battery weighs 41 grams, occupies a volume of 16.4 cu cm, and contains two separate 500-volt channels, each designed to charge a 5.25-microfarad capacitor within 300 milli-seconds and remain operational under a 640-kohm load for a minimum of 28 seconds over a temperature range of +16 to +71 C. The electrochemical system utilizes a calcium anode, LiCl-KCl molten salt electrolyte, a CaCrO4--K2CrO4 mixture as the depolarizer or active cathode material, and an iron cathode. The depolarizer and electrolyte, along with a silica binder, are formed into homogeneous pellets, and these pellets are stacked alternately with calcium-iron bimetal discs in beryllium oxide tubes to form cell stacks. The cells are activated by an iron-potassium perchlorate pyrotechnic heat source external to the BeO tubes. Significant development problems and performance characteristics are discussed.
Author (NSA)

N75-16989# Sandia Labs., Albuquerque, N.Mex.
REVIEW OF THERMAL BATTERY TECHNOLOGY
B. H. VanDomelen and R. D. Wehrle 1974 6 p refs Presented at the 9th Intersociety Energy Conversion Eng. Conf., San Francisco, 26 Aug. 1974 Sponsored by AEC
(SLA-74-5381; Conf-740805-4) Avail: NTIS HC $3.25

The evolution of thermal battery technology from World War II to the present is reviewed. The first applied work with thermal cells, the transfer of this laboratory technology to the United States, the development of the initial cup technology by the U.S., and the evolution of this technology to the later pellet technology are discussed. Author (NSA)

N75-16990# Argonne National Lab., Ill.
DEVELOPMENT OF HIGH SPECIFIC ENERGY BATTERIES FOR ELECTRIC VEHICLES Progress Report, Aug. 1973 - Jan. 1974
P. A. Nelson, E. C. Gay, R. K. Steunenberg, J. E. Battles, W. W. Schertz, D. R. Vissers, K. M. Myles, D. S. Webster, and L. Burris Jun. 1974 39 p refs
(Contract W-31-109-eng-38)
(ANL-8058) Avail: NTIS HC $3.75

The development of a high specific energy lithium/sulfur battery having the performance characteristics required for powering pollution free automobiles is considered. The cells have negative electrodes of molten lithium and positive electrodes of iron sulfide separated by a molten lithium halide-containing electrolyte. The operating temperature of the cells is about 400 C. Cells with negative electrodes of liquid lithium and positive electrodes of FeS2-Li2S mixtures in graphite housings achieved short time peak power densities as high as 1.4 W/sq cm, and sustained power densities up to 0.6 W/sq cm for approximately 50 sec. Capacity densities as high as 0.38 A-hr/sq cm were achieved upon charging at a current density of 0.025 A/sq cm and discharging at 0.1 A/sq cm. Several cells were operated for more than 500 hr and 100 cycles with only moderate declines in capacity density over the cell lifetime. Author (NSA)

N75-16991# Sandia Labs., Albuquerque, N.Mex. Exploratory Batteries Div.
PELLET TYPE THERMAL BATTERY
D. M. Bush Jul. 1974 21 p
(Contract AT(29-1)-789)
(SAND-74-0007) Avail: NTIS HC $3.25

A prototype thermal battery was developed which incorporates a pelletized heat source as well as pelletized depolarizer and electrolyte materials. The system used was Ca/LiCl-KCl/CaCr O4. Fabrication, assembly, and test results are discussed.
Author (NSA)

N75-16992# Sandia Labs., Albuquerque, N.Mex.
INTEGRATION OF PHOTOVOLTAIC AND SOLAR THERMAL ENERGY CONVERSION SYSTEMS
F. L. Vook and D. G. Schuler Jul. 1974 19 p refs
(Contract AT(29-1)-789)
(SAND-74-0093) Avail: NTIS HC $3.25

For optimal solar energy utilization to reduce fossil consumption for residential energy needs, it is proposed to integrate photovoltaic and solar-thermal energy conversion systems to provide household electricity, hot water, space heating, and air conditioning. Author (NSA)

N75-16993# Atomic Energy Commission, Washington, D.C. Div. of Headquarters Services.
SOLAR ENERGY PROGRAM PLAN FOR HEATING AND COOLING BUILDINGS
R. P. McGee, J. E. Rannels, and C. I. York Feb. 1974 41 p refs
(WASH-1337-5-Draft) Avail: NTIS HC $3.75

A program is presented to accelerate the development and marketing of solar heating and cooling systems for buildings, using existing technology, with a goal of achieving commercial production on a national scale within five years. Author (NSA)

N75-16994# Sandia Labs., Albuquerque, N.Mex.
SIXTY MINUTE THERMAL BATTERY: A FEASIBILITY STUDY
D. M. Bush and A. R. Baldwin 1974 28 p refs Presented at the 9th Intern. Power Sources Symp., Brighton, United Kingdom, 17 Sep. 1974 Sponsored by AEC
(SLA-73-5888; Conf-740908-1) Avail: NTIS HC $3.75

An experimental unit, designated the XP60, is being used to study the feasibility of a 60-minute thermal battery. It has a pellet-type configuration, including iron-potassium perchlorate heat pellets. The electrochemical system is Ca/LiCl-KCl, CaCrO4/Fe. There are twelve cells, 8.25 cm in diameter, assembled on a mandrel. Cell stack temperatures were determined by placing thermocouples in individual cells and recording the temperature during battery discharge. Thermal and electrical data are presented for specific batteries, several of which had activated lives exceeding 60 minutes. Author (NSA)

N75-16995# New South Wales Univ., Kensington (Australia). School of Nuclear Engineering.
COMPARISON OF THE ENVIRONMENTAL ASPECTS OF NUCLEAR AND FOSSIL FUELED POWER STATIONS
Z. J. Holy 1973 9 p refs Presented at the Ann. Eng. Conf., New South Wales, Australia, 20 May 1974
(Conf-740555-1) Avail: AEC Depository Libraries HC $4.00

The major problems facing our society today are the growing demands for energy and the pollution associated with its generation. The major environmental hazards associated with both fossil fueled and nuclear power stations are discussed. The environmental and biological effects of air pollution, thermal

pollution, radioactive effluents from power stations and fuel reprocessing plants, and radioactive waste disposal are dealt with, and the safety of nuclear power stations discussed. Methods are outlined for the comparison of hazards associated with fossil fired and nuclear plants, and one of these is used in the analysis. Author (NSA)

N75-16996# California Univ., Livermore. Lawrence Radiation Lab.

USE OF METHANOL IN TRANSPORTATION

W. T. Crothers 1 Jul. 1974 37 p refs

(Contract W-7405-eng-48)

(UCID-16528) Avail: NTIS HC $3.75

The methanol process has the highest efficiency in converting coal to a liquid fuel and an energy recovery factor between 50 and 55 percent. Other fuels, such as synthetic gasoline result in about 20 percent additional loss and have an energy recovery factor between 40 and 45 percent. Technology for the conversion to this clean fuel is a proven chemical processing technique. Other coal liquefaction methods are in the pilot plant stages. Methanol and gasoline performance in various engines is compared. Methanol is as hazardous as gasoline and similar in other respects. It can be blended with gasoline and has the potential of less emissions than gasoline. With slight engine modifications, it will perform well in gasoline-powered vehicles. Author (NSA)

N75-16997# Oak Ridge National Lab., Tenn.

RECOMMENDED RESEARCH PROGRAM IN GEOTHERMAL CHEMISTRY

R. N. Lyon, comp. and G. A. Kolstad, comp. Oct. 1974 48 p Sponsored by AEC

(WASH-1344) Avail: NTIS HC $3.75

The research program is aimed at obtaining fundamental chemical data for geothermal processes. The program covers five general areas: thermodynamic and physical properties of geothermal solutions, minerals, and metals; kinetics of chemical reactions and deposition; collection, evaluation, and dissemination of physical and chemical data; natural systems and rock-water interactions; and theoretical modeling of geothermal systems. NSA

N75-16998# Societe des Accumulateurs Fixes et de Traction, Romainville (France). Dept. Accumulateurs Alcalins.

STUDY OF NICKEL-CADMIUM BATTERIES FOR USE IN APPLICATIONS SATELLITES, PHASE 2. EVALUATION OF CHARGING EFFICIENCY OF VO 23S Ni-Cd BATTERIES [ETUDE DES ACCUMULATEURS Ni-Cd POUR UTILISATION DANS LES SATELLITES D'APPLICATION. RAPPORT NO. 3, EVALUATION DU RENDEMENT DE CHARGE D'ACCUMULATEURS Ni-Cd VO 23S]

S. Font Feb. 1973 67 p In FRENCH

(Contract ESTEC-1358/71-SL)

(DT/SAS-108/73-SF/JM; Rept-03; ESRO-CR(P)-325) Avail: NTIS HC $4.25

The changing efficiency of Ni-Cd batteries for spacecraft power supplies was measured at temperatures of -20, 0, 20, and 40 C and at various charging rates. Results are presented in tabular and graphic form and conclusions are drawn for optimal performance in geostationary orbit. ESRO

N75-16999# Societe des Accumulateurs Fixes et de Traction, Romainville (France). Dept. Accumulateurs Alcalins.

STUDY OF NICKEL-CADMIUM BATTERIES FOR USE IN APPLICATIONS SATELLITES, PHASE 2. THERMAL EVALUATION OF VO 23S BATTERY [ETUDES DES ACCUMULATEURS Ni-Cd POUR UTILISATION DANS LES SATELLITES D'APPLICATION. RAPPORT NO. 6, EVALUATION THERMIQUE DE L'ACCUMULATEUR VO 23S]

S. Font May 1973 40 p In FRENCH

(Contract ESTEC-1358/71-SL)

(DT/SAS-269/73; Rept-06; ESRO-CR(P)-328) Avail: NTIS HC $3.75

The evaluation of the thermophysical characteristics of Ni-Cd batteries for power supply of geostationary satellites was effected both theoretically and by microcalorimetry. The specific heat measured was 0.205 + or - 0.015 cal/gC, and heat capacity 205 + or - 15 cal/C. Heat dissipation was measured in vacuum during overcharging cycles. The evolution of tension and temperature as a function of time is graphically represented. A theoretical model is established on the basis of these results. ESRO

N75-17000# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.

SRET 1: SOLAR CELL EXPERIMENTATION [SRET 1: EXPERIENCES CELLULES SOLAIRES]

J. Bernard and M. Lemetayer (CNES) May 1974 115 p refs In FRENCH

(Contract CNES-0515-74)

(ONERA-DERTS-NT-02-36) Avail: NTIS HC $5.25

Thin film CdS and Cd Te solar cells and silicon cells were studied during 15 months in orbit on the French satellite, SRET-1, launched by the U.S.S.R. in April 1972. Degradation measurements were carried out. Dispersion of results seems to hint at a spontaneous recovery process, especially for CdS. ESRO

N75-17001# National Centre of Tribology, Risley (England). European Space Tribology Lab.

THERMAL VACUUM ACCELERATED LIFE TEST OF NO. 1 HAWKER SIDDELEY DYNAMICS LOW SPEED MECHANISM

J. Gillies Oct. 1974 57 p Sponsored by ESRO

(ESRO-ESTL-9; ESRO-CR(P)-564) Avail: NTIS HC $4.25

A solar array drive mechanism, was subjected to an accelerated life test under vacuum. The accelerated life test involved operating the mechanism at increased speed sufficient to accrue the equivalent of 10 years normal speed running (1 revolution of the drive shaft per day) in 30 weeks of testing. During the test, the mechanism was generally run at 24 times normal speed (1 revolution of the drive shaft per hour) and subjected to programmed thermal cycling simulating temperature conditions which would occur during satellite operation. Periodically thermal transient conditions were imposed on the mechanism in simulation of eclipse operation and during these tests, the mechanism was rotated at 1 rev/day. Measurements were made of the angular error (difference between clock demand and actual shaft position), drive motor power, temperatures throughout the mechanism and power slip ring noise levels. The mechanism operated within its specification during all the tests. Author (ESRO)

N75-17002# Electrical Research Association, Leatherhead (England).

DEVELOPMENT OF INTEGRAL COVERS FOR SILICON SOLAR CELLS Final Report

G. Brackley, K. Lawson, R. G. Pickard, and D. W. Satchell Paris ESRO Nov. 1974 58 p refs

(Contract ESTEC-1407/71)

(ESRO-CR-215) Avail: NTIS HC $4.25

Improvements in the quality and performance of integral covers produced by radiofrequency sputtering are noted. Most requirements of thickness, transparency, adhesion, stress and resistance to radiation damage were satisfied. The reasons are the choice of DC7070 glass and the discovery that great care must be taken in locating the substrates in the work chamber. Work chamber design was also discussed. Author (ESRO)

N75-17003# Massachusetts Univ., Amherst.

TECHNICAL AND ECONOMIC FEASIBILITY OF THE OCEAN THERMAL DIFFERENCES PROCESS AS A SOLAR-DRIVEN ENERGY PROCESS Semiannual Progress Report, 1 Apr. - 30 Jun. 1974

W. E. Heronemus 31 Jul. 1974 47 p refs

(Grant NSF GI-34979)

(PB-236422/2; SAPR-1; NSF/RANN/SE/GI-34979/PR/74/2; NSF/RA/N-74-086) Avail: NTIS HC $3.75 CSCL 10B

The feasibility of the ocean thermal differences process practiced along the southeast coast of the United States in the Gulf Stream is considered. The complete thermal cycle has been integrated into both a complex computer simulation and an abbreviated simulation. The heat transfer correlation used is conservative and is though to reflect film and fouling conditions typical in clean sea water. The turbine has set the sized of the optimal power package: the power package condenser then

sets size and shape of containment, and the total system evolves from that nucleus. The system baseline configuration method is being employed with perturbations in all subsystems and components related back to the baseline. (Modified author abstract) GRA

N75-17004# Bureau of Mines, Washington, D.C.
FUEL AND ENERGY DATA: UNITED STATES BY STATES AND REGIONS, 1972 Information Circular
Lulie H. Crump and Charles L. Reading Sep. 1974 88 p refs (Contract DI-BM-IC-8647)
(PB-236581/5; BM-IC-8647) Avail: NTIS MF $2.25; SOD HC $1.25 as I28.27:8647 CSCL 21D

Salient information on reserves, production, and consumption of fuels and energy by state are summarized. Data are broken down by fossil fuels (coal, petroleum, and natural gas) and hydropower and nuclear for the major consuming sectors: household-commercial, industrial, transportation, electric power, and miscellaneous. In addition, total energy consumption in the Nation in 1972 is compared with consumption in 1971 and 1973. GRA

N75-17005# National Center for Energy Management and Power, Philadelphia, Pa.
LATENT HEAT AND SENSIBLE HEAT STORAGE FOR SOLAR HEATING SYSTEMS
Harold G. Lorch May 1974 33 p refs Revised
(Grant NSF GI-27976)
(PB-236190/5; NSF/RANN/SE/GI-27976/TR/72/20; NSF/RA/N-74-059) Avail: NTIS HC $3.75 CSCL 10A

Thermal energy storage suitable for solar heating and off-peak air conditioning was investigated in devices using either sensible heat or latent heat. Parametric designs for two latent heat materials (sodium thiosulfate pentahydrate and a paraffin wax) and for a sensible heat material (a 1:1 mixture of water and ethylene glycol) were compared as to cost, performance, and space requirements. The conditions of equal cost for latent heat and sensible heat storage systems were determined as functions of material properties and the temperature swing allowed in the sensible heat storage tank. The comparative designs include the cost of the heat exchanger required for latent heat storage and the operating penalty due to temperature swings occurring for sensible heat storage. GRA

N75-17006# Rice Univ., Houston, Tex.
PROCEEDINGS OF THE WORKSHOP ON NEEDS FOR FUNDAMENTAL RESEARCH IN CATALYSIS AS RELATED TO THE ENERGY PROBLEM
Joe W. Hightower, W. Keith Hall, George W. Keulks, and Sol W. Weller 25 Jun. 1974 29 p refs Workshop held at Houston, Tex., 24-25 Jun. 1974
(Grant NSF GP-44178)
(PB-236683/9) Avail: NTIS HC $3.75 CSCL 10B

The report includes the proceedings and recommendations of a workshop on fundamental research in catalysis related to energy problems held at Rice University June 24-25, 1974. Research areas given special attention were: the production and use of carbon monoxide and hydrogen mixtures, liquefaction, electrocatalysis, and pollution control. Consideration was also given to non-conventional catalytic processes with particular attention to those, such as photo-catalysis, which may bear on solar energy utilization. It was emphasized that fundamental research in catalysis is very important to the long-range aspects of energy conversion. Singled out for emphasis were: reaction mechanisms, surface characterization, catalyst deactivation, catalytic theory, exploratory research on energy systems, and equipment. GRA

N75-17007# Foster Associates, Inc., Washington, D.C.
PROSPECTIVE REGIONAL MARKETS FOR COAL CONVERSION PLANT PRODUCTS PROJECTED TO 1980 AND 1985. VOLUME 2: CURRENT AND PROJECTED DEMAND, SUPPLY AND PRICE OF ENERGY IN THE UNITED STATES Final Report, Feb. 1973 - Sep. 1974
Nov. 1974 258 p
(Contract DI-14-32-0001-1509)
(PB-236632/6; OCR-102-Vol-2) Avail: NTIS HC $8.50 CSCL 10A

Historical supply of and demand for energy in the U.S. is discussed. Factors considered are: (1) consumption of energy in 1971; (2) energy consumption projected to 1980 and 1985; (3) historical, current, and projected price of energy; (4) supply and price of oil, gas, and coal; and (5) electric power supply and the cost of electricity. GRA

N75-17008# Foster Associates, Inc., Washington, D.C.
PROSPECTIVE REGIONAL MARKETS FOR COAL CONVERSION PLANT PRODUCTS PROJECTED TO 1980 AND 1985. VOLUME 3: CURRENT AND PROJECTED DEMAND, SUPPLY AND PRICE OF ENERGY IN THE UNITED STATES, SCHEDULES Final Report, Feb. 1973 - Sep. 1974
Nov. 1974 311 p
(Contract DI-14-32-0001-1509)
(PB-236633/4; OCR-102-Vol-3) Avail: NTIS HC $9.25
For abstract, see N75-17007.

N75-17196* Rocketdyne, Canoga Park, Calif.
ROCKET ENGINE HEAT TRANSFER AND MATERIAL TECHNOLOGY FOR COMMERCIAL APPLICATIONS
John Hiltabiddle and John Campbell *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 61-88 (For availability see N75-17188 08-80)
CSCL 10A

N75-17197* Denver Research Inst., Colo.
APPLICATIONS OF AEROSPACE TECHNOLOGY IN THE ELECTRIC POWER INDUSTRY
F. Douglas Johnson and Conrad F. Heins *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 89-96 ref (For availability see N75-17188 08-80)
CSCL 10B

N75-17200* Houston Univ., Tex.
ENERGY RECOVERY FROM SOLID WASTE
Charles Dalton and C. J. Huang *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 121-132 refs (For availability see N75-17188 08-80)
CSCL 10A

N75-17201* Chamber of Commerce, Houston, Tex.
ADAPTATIONS OF ADVANCED SAFETY AND RELIABILITY TECHNIQUES TO PETROLEUM AND OTHER INDUSTRIES
Paul E. Purser *In its* Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 133-142 refs (For availability see N75-17188 08-80)
CSCL 13H

N75-17210* Houston Univ., Tex.
ECONOMIC MODELING AND ENERGY POLICY PLANNING
Russell G. Thompson, Andrew Schwartz, Jr., Rodrigo J. Lievano, and John C. Stone *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 239-243 (For availability see N75-17188 08-80)
CSCL 10A

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-17009 British Library Lending Div., Boston Spa (England).
SEAS MUST BE CLEAN
I. Matov [1974] 3 p Transl. into ENGLISH from the Russian (BLL-M-23509-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The pollution of sea water by marine transportation and oil products shipping is controlled in the U.S.S.R. by chemical/mechanical closed flushing cycles on ships and by special collecting vessels that approach ships to receive the oil containing liquid waste and dry garbage for disposition in sewage and purification systems. G.G.

N75-17010 British Library Lending Div., Boston Spa (England).
BIOSPHERIC POLLUTION CONTROL, ECONOMIC AND SOCIAL ASPECT
B. Maklyarski 1974 16 p refs Transl. into ENGLISH from Miro Ekon. Mezhdunarodnyie Otnosehniya (USSR), no. 5, 1974 (BLL-M-23595-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

An analysis of the problems of environmental pollution and the effects on the biosphere is presented. It is stated that a means must be developed to enable effective use to be made of scientific and technological achievements to meet the essential material requirements of society without adversely affecting the ecological balance. The authors recommend that action be taken to maintain the present level of population and prevent additional population expansion. Various forecasts which analyze the state of natural resources, nonrenewable resources, and the industrial impact are examined. Specific methods for improving the quality of the water and the air are recommended. Author

N75-17011*# Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.
AIR POLLUTION FROM FUTURE GIANT JETPORTS
James A. Fay May 1970 13 p refs
(Grant NGR-22-009-378)
(NASA-CR-142165) Avail: NTIS HC $3.25 CSCL 13B

Because aircraft arrive and depart in a generally upwind direction, the pollutants are deposited in a narrow corridor extending downwind of the airport. Vertical mixing in the turbulent atmosphere will not dilute such a trail, since the pollutants are distributed vertically during the landing and take-off operations. As a consequence, airport pollution may persist twenty to forty miles downwind without much attenuation. Based on this simple meteorological model, calculations of the ambient levels of nitric oxide and particulates to be expected downwind of a giant jetport show them to be about equal to those in present urban environments. These calculations are based on measured emission rates from jet engines and estimates of aircraft performance and traffic for future jetports. Author

N75-17012*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF REPRESENTATION OF ACOUSTIC SPECTRA AND REFLECTION CORRECTIONS APPLIED TO EXTERNALLY BLOWN FLAP NOISE
Jeffrey H. Miles Washington Feb. 1975 69 p refs
(NASA-TM-X-3179; E-8043) Avail: NTIS HC $4.25 CSCL 20A

A computer method for obtaining a rational function representation of an acoustic spectrum and for correcting reflection effects is introduced. The functional representation provides a means of compact storage of data and the nucleus of the data analysis method. The method is applied to noise from a full-scale externally blown flap system with a quiet 6:1 bypass ratio turbofan engine and a three-flap wing section designed to simulate the take-off condition of a conceptual STOL aircraft. Author

N75-17013# Joint Publications Research Service, Arlington, Va.
TELEMETRIC SYSTEM FOR SANITARY CHEMICAL AIR POLLUTION CONTROL
A. N. Shcherban, N. I. Furman, A. V. Primak, V. I. Kopeykin, A. S. Pokarzhevskiy, A. G. Marusov, L. N. Dashevskiy, and A. T. Khomyakov 30 Dec. 1974 10 p refs Transl. into ENGLISH from Khim. Tekhnol. (Kiev), no. 3, 1972 p 49-52
(JPRS-63758) Avail: NTIS HC $3.25

An automatic air-pollution monitoring network is described which is composed of a telemetric system of dispersed objects with multichannel measurement of several parameters within each object. Author

N75-17014# Battelle-Northwest, Richland, Wash. Atmospheric Sciences Dept.
PARTICLE AND GASEOUS REMOVAL IN THE ATMOSPHERE BY DRY DEPOSITION
G. A. Sehmel and W. H. Hodgson May 1974 10 p refs Presented at the Symp. on Atmospheric Diffusion and Air Pollution, Santa Barbara, Calif., 9-13 Sep. 1974
(Contract AT(45-1)-1830)
(BNWL-SA-4941; Conf-740922-8) Avail: NTIS HC $3.25

Airborne pollutants are removed from the atmosphere by dry deposition. Removal fluxes are dependent on airborne concentrations, particle diameter, deposition surface, and meteorological conditions. In literature descriptions of field experiments, deposition rates were characterized in terms of a deposition velocity, Vd. The term Vd is an overall mass transfer coefficient that includes effects of both surface resistance in the lower 1 cm adjacent to the deposition surface as well as transport resistance from the pollutant concentration measurement height to 1 cm. In these field experiments, deposition velocities, were evaluated using particles with relatively wide size distributions for deposition velocity measurements. Since deposition velocities are dependent on particle diameter, quantities Vd of describe deposition rates only for particle size distributions used in the field determination of Vd. In contrast, deposition velocities, K, were evaluated in wind tunnel experiments using single sized particles and including only surface mass transfer resistance. Author (NSA)

N75-17015# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Radiochemie.
CHEMICAL REACTION OF ATMOSPHERIC POLLUTANTS
K. H. Becker, W. G. Filby, K. Guenther, H. Guesten, G. Heinrich, C. Keller, J. Knapp, U. Kuhnes, R.-D. Penzhorn, W. Schock et al May 1974 112 p refs In ENGLISH and GERMAN
(KFK-1975-UF) Avail: AEC Depository Libraries HC $8.75

The homogeneous removal rate of sulfur dioxide from the lower atmosphere of Central Europe is calculated on the basis of the photophysical data of SO2 within its absorption bands (2900 to 4000 A) and the measured monochromatic actinic irradiance (solar quantum flux) in Central Europe. The maximum rate of the sunlight-induced photooxidation is found to be 0.25% per hour. This value is compared with those obtained from experiments in simulated and real atmospheres. Author (NSA)

N75-17016# California Univ., Livermore. Lawrence Radiation Lab.
DEVELOPMENT OF AN AIR POLLUTION MODEL FOR THE SAN FRANCISCO BAY AREA Semiannual Report
23 Sep. 1974 9 p refs
(Contract W-7405-eng-48)
(UCRL-51660; SAR-3) Avail: NTIS HC $3.25

A regional air pollution model which can be applied to the air quality problems facing the San Francisco Bay Area is developed and validated. Subtasks of the program are described and corresponding activities summarized. Author (NSA)

N75-17017# California Univ., Livermore. Lawrence Livermore Lab.
HAS MAN, THROUGH INCREASING EMISSIONS OF PARTICULATES, CHANGED THE CLIMATE
H. W. Ellsaesser 1 Aug. 1974 24 p refs Presented at Atmospheric-Service Exchange of Particulates and Gaseous Pollutants Symp., Richland, Wash., 4 Sep. 1974 Revised Sponsored by AEC and DOT
(UCRL-75902-Rev-1; Conf-740921-2) Avail: NTIS HC $3.25

Diverse data relating to natural and anthropogenic particulate emissions and trends in atmospheric turbidity are reviewed. Values derived for the anthropogenic effect on the trend in total airborne particulates (if assumed monotonic) range from 0.06 to 0.45 increase per year. Since such an effect would be only marginally detectable in the available record, the much larger rates of increase published as proof of an upward trend must be due to local or temporary effects and cannot be representative of a global trend. On the other hand almost all urban areas plagued by dirty skies prior to the 1940's have shown in recent years measurable improvement in terms of visibility, dust fall, suspended particulates or the ratio of sunshine in the central city to that at an outlying station. This leads to the conclusion that while an anthropogenic upward trend in airborne particulates existed in the past, it was halted and may even have been reversed over the past few decades. Author (NSA)

N75-17018# Stockholm Univ. (Sweden). Inst. of Meteorology.
REGIONAL DISPERSION AND DEPOSITION OF ATMOS-

PHERIC POLLUTANTS WITH PARTICULAR APPLICATION TO SULFUR POLLUTION OVER WESTERN EUROPE
Bert Bolin and Christer Persson 31 May 1974 64 p refs Partly sponsored by Nordforsk
(Contract SWEDEPB-7-126/73)
(AC-28) Avail: NTIS HC $4.25

The basic transfer equation interrelating sources and sinks for atmospheric pollutants through the turbulent processes in the atmosphere was reformulated in a statistical manner. Since on the regional scale the synoptic disturbances are the essential turbulent elements, their statistics were considered using geostrophic trajectory computations. The various scales of atmospheric turbulence were analyzed with regard to their importance for vertical transfer. The sink mechanisms of rain-out and wash-out (interior sinks) and direct deposition at the lower boundary (boundary transfer) are also described statistically. The skeleton of a regional dispersion model is developed and its advantages and limitations are discussed. As an example, a simplified study of the emission, dispersion, and removal of atmospheric sulfur is presented. Author (ESRO)

N75-17019# Scott Research Labs., San Bernandino, Calif.
EXHAUST EMISSION AND COST EVALUATION OF THE STATE OF CALIFORNIA'S ROADSIDE IDLE EMISSION INSPECTION PROGRAM Final Report, 20 Apr. - 20 Oct. 1973
Warren C. Kelly 7 Dec. 1973 56 p ref Sponsored by California State Air Resources Board
(PB-235990/9; SLR-2125-04-1273; ARB-R-2-1330-73-17) Avail: NTIS HC $4.25 CSCL 13B

A test program was conducted for the California Air Resources Board to evaluate the effectiveness of the California Highway Patrol roadside idle emission inspection and subsequent vehicle maintenance practices. Test method and evaluation procedures are described, and results are discussed. GRA

N75-17209* Houston Univ., Tex.
NATIONAL ECONOMIC MODELS OF INDUSTRIAL WATER USE AND WASTE TREATMENT
Russell G. Thompson and James A. Calloway *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 229-237 (For availability see N75-17188 08-80)
CSCL 13B

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N75-17020*# Franklin Inst., Swarthmore, Pa. Bartol Research Foundation.
ANALYSIS OF PROTON AND ELECTRON SPECTROMETER DATA FROM OGO-5 SPACECRAFT Final Report, 1 Jul. 1973 - 31 Jul. 1974
Martin A. Pomerantz 13 Feb. 1975 95 p refs
(Grant NGR-39-005-105)
(NASA-CR-142078) Avail: NTIS HC $4.75 CSCL 08N

The interaction between the geomagnetic and interplanetary magnetic fields is studied through its effects upon the intensities of solar electrons reaching the polar caps during times of strongly anisotropic electron fluxes in the magnetosheath. During the particle event of November 18, 1968, electrons of solar origin were observed outside the magnetopause with detectors aboard OGO-5. Correlative studies of these satellite observations and concurrent measurements by riometers and ionospheric forward scatter systems in both polar regions revealed that the initial stage of the associated polar cap absorption event is attributable to the arrival of solar electrons. Evidence of a north-south asymmetry in the solar electron flux, at a time when the interplanetary magnetic field vector was nearly parallel with the ecliptic plane, supports an open magnetospheric model. The analysis indicates that an anisotropic electron flux may be isotropized at the magnetopause before propagating into the polar regions. Author

N75-17021*# Techtran Corp., Glen Burnie, Md.
AN AUTOMATED SYSTEM FOR INTERPRETING GRAVITATIONAL ANOMALIES (THE MINIMIZATION METHOD)
Ye. G. Bulakh Washington NASA Jan. 1975 110 p refs Transl. into ENGLISH of the book "Avtomatizirovannaya Sistema Interpretatsii Gravitatsionnykh Anomaliy" Kiev, Naukova Dumka Press, 1973 111 p
(Contract NASw-2485)
(NASA-TT-F-15750) Avail: NTIS HC $5.25 CSCL 20J

An automated system is described for interpreting gravitational anomalies based on the minimization method and consisting of separate components. It includes solving direct problems, calculating a background function, computing the density parameters of blocks which form the region under investigation, and determining the parameters which characterize the coordinates and dimensions of the geological feature. The use of all components of the system is illustrated by several practical examples in geological interpretation. Author

N75-17022*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THE EARTH AS A RADIO SOURCE: THE NON-THERMAL CONTINUUM Progress Report
Donald A. Gurnett Dec. 1974 54 p refs Submitted for publication
(Contracts NAS5-11074; NAS5-11431; Grants NGL-16-001-043; NGL-16-001-002; Contract N00014-68-A-0196-0009)
(NASA-CR-142076) Avail: NTIS HC $4.25 CSCL 04A

A weak nonthermal continuum, radiated by the earth from energetic electrons in the outer radiation zone, is studied. It is shown that the frequency spectrum of the continuum radiation consists of two components, a trapped component, which is permanently trapped within the magnetosphere at frequencies below the solar wind plasma frequency, and an escaping component which propagates freely away from the earth at frequencies above the solar wind plasma frequency. Direction finding measurements and measurements of the spatial distribution of intensity for both components indicated that the continuum radiation is generated (1) in a broad region which extends through the morning and early afternoon immediately beyond the plasmapause boundary, and (2) over a broad range of latitudes, including the magnetic equator. Possible mechanisms by which this radiation is generated, including gryo-synchrotron radiation from energetic electrons in the outer radiation zone, are discussed. Author

N75-17023# Southwest Research Inst., San Antonio, Tex.
A PRACTICAL MODEL LAW FOR CHEMICAL EXPLOSIVE FRACTURE OF OIL SHALE Final Technical Report
W. E. Baker, J. Lankford, and A. B. Wenzel Dec. 1974 78 p refs Prepared for Sandia Labs, Albuquerque, N. Mex.
(SwRI Proj. 02-4003)
Avail: NTIS HC $4.75

A scale model law is developed for fracturing of oil shale by chemical explosives. The design of practical model scale experiments to verify the law and to obtain data on fracture characteristics of shale or a brittle simulant of shale under explosive loading is discussed. The compressive failure characteristics of samples of oil shale are determined from small specimens under controlled laboratory conditions. These data are reported for a wide range of strain rates and initial confining pressures simulating overburden stresses, for three grades of shale. Shock Hugoniots for shale are estimated. A review of the literature on rock fracture under explosive loading, and properties of gaseous and condensed explosives, is included. Author

N75-17024*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
DESIGN OF A SIMPLE GERDIEN CONDENSER FOR IONOSPHERIC D-REGION CHARGED PARTICLE DENSITY AND MOBILITY MEASUREMENTS
Hashem Farrokh 6 Jan. 1975 75 p refs
(Grants NGR-39-009-218; DA-ARO(D)-31-124-72-G158)
(NASA-CR-142107; PSU-IRL-SCI-433) Avail: NTIS HC $4.25 CSCL 04A

The theory of a Gerdien condenser operating in a collision controlled medium is reviewed. Design and electronics of a Gerdien

condenser probe suitable for flying on the Arcas rocket is presented. Aerodynamics properties of the instrument in continuous flow are discussed. The method of data reduction and experimental results of one successful flight at White Sands Missile Range (WSMR), New Mexico, on 11 January 1974 are reported. This investigation shows positive ions in two relatively distinct mobility groups between 47 and 65 km and a more continuous distribution of mobilities between 38 and 47 km.
Author

N75-17025# Joint Publications Research Service, Arlington, Va.
USE OF A HYDROPHONE IN THE REGISTRY OF SEISMIC PROCESSES
S. I. Voronina, N. G. Zhidkov, and R. G. Lyapisheva 30 Dec. 1974 11 p refs Transl. into ENGLISH from Tr. Sakhalinskogo Kompleksnogo Nauchnoissledovatelskogo Inst. (Yuzhnyy Sakhalinsk), v. 29, 1972 p 40-46
(JPRS-63767) Avail: NTIS HC $3.25

This report contains some results of comparatively brief registry of signals from underwater earthquakes using hydroacoustic equipment temporarily placed in the coastal shelf zone at a distance of 21 km from the shoreline. Author

N75-17026# Department of Supply, Melbourne (Australia). Antarctic Div.
ASSOCIATION BETWEEN SOME FARADAY MEASUREMENTS AND AURORAL PARTICLE PRECIPITATION
B. J. Watkins [1974] 18 p refs
(ANARE-TN-10) Avail: AEC Depository Libraries HC $4.00

The ionospheric total electric content (TEC) was measured continuously from Macquarie Island (54.5 S, 159 E, geog.) by monitoring the polarization angle of the radio beacon from the geostationary satellite INTELSAT 2F-2. The ionosphere measured is often near or inside the auroral oval during evenings, and an association was found between TEC increases and auroral particle precipitation. Correlation with all-sky camera photographs indicates a TEC increase caused by a multiple quiet arc structure. The average electron density was calculated from the TEC data in conjunction with the auroral dimensions determined from the photographs. The average electron density over a height range up to about 170 kms for a multiple quiet arc structure was 300,000 /cu cm. The subsequent breakup and poleward expansive phase of the substorm produced a further TEC increase.
Author (NSA)

N75-17027# Oak Ridge National Lab., Tenn.
GEOCHEMICAL APPLICATIONS OF ELECTRON MAGNETIC RESONANCE SPECTROSCOPY
R. A. Weeks, D. L. Griscom, and P. M. Bell 1974 10 p refs Presented at the 18th Ampere Congr., Nottingham, England Sponsored by AEC
(Conf-740942-1) Avail: NTIS HC $3.25

Similarities in the ferromagnetic resonance spectra of terrestrial basalts, lunar soils, and synthetic materials containing magnetic ferric oxide particles are discussed. Optical and electron paramagnetic resonance spectral components of a synthetic glass with a composition similar to Apollo 17 glass are due to Ti(3 +), and their intensities increase with decreasing oxygen pressure. Corresponding spectra of the Apollo 17 glass do not contain components due to Ti(3 +). Author (NSA)

N75-17028# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
STRATOSPHERIC FLOW AND SOLAR VARIABILITY
Atmospheric Science Paper No. 223
B. C. MacDonald Apr. 1974 78 p refs
(Contract AT(11-1)-1340)
(TID-26632) Avail: NTIS HC $4.75

Research relating to solar variability to weather elements on earth is presented. A response of stratospheric flow associated with the polar night vortex to this variability is determined beginning three to five days after the occurrence of a geomagnetic storm. The contour gradient at the 10 millibar surface near the edge of this vortex steepens, and the flow near the edge becomes more meridional. Warmings detected at this level tend to propagate downward. The reaction of the polar vortex flow seems to be most marked when the flow is nearly unstable. Some mechanisms presented by other workers in this field as well as the implications of these findings are discussed. Author (NSA)

N75-17029# Battelle-Northwest, Richland, Wash. Pacific Northwest Labs.
ATMOSPHERIC SCIENCES, PART 3 Annual Report, 1973
C. L. Simpson Apr. 1974 292 p refs
(Contract AT(45-1)-1830)
(BNWL-1850-Pt-3) Avail: NTIS HC $8.75

The interaction of pollutants with cloud and precipitation droplets and with the earth's surface was examined. Studies were also made of transport of contaminants released from nuclear facilities which are ultimately delivered to human populations and ecological systems. Emphasis was placed on pollutant removal and resuspension processes. Characterization of sources and ambient pollants, transport diffusion and turbulence, and atmospheric transformation processes were also covered.
Author

N75-17030# Kiruna Geophysical Observatory (Sweden).
KIRUNA GEOPHYSICAL DATA. DATA SUMMARY 74/1-3, JANUARY-MARCH 1974
G. Gustafsson, ed. Mar. 1974 69 p
Avail: NTIS HC $4.25

Data recorded at Kiruna, relating to geomagnetic variations and storms, earth currents, auroras, cosmic noise, and ionospheric absorption are presented. Measurements include geomagnetic K-indices and all-sky camera records. Magnetograms, riometer recordings, and routine ionograms from the down range station are reproduced. ESRO

N75-17031# Innsbruck Univ. (Austria). Inst. fuer Weltraumforschung.
GROWTH RATES OF THE ION CYCLOTRON INSTABILITY IN THE EARTH'S MAGNETOSPHERE
E. Maerk May 1974 12 p refs Submitted for publication
(UNICP-AR-3) Avail: NTIS HC $3.25

The effect of injecting cold plasma with different ion masses on the growth rate of the ion cyclotron instability in the earth magnetosphere is discussed in detail. To study the behavior of the ion cyclotron instability in the case of cold, eventually artificial, plasma, the growth rate was calculated in zero, first, and second order approximation using the dispersion relation based on bi-Maxwellian distribution functions, for a magnetoplasma consisting of the trapped high energy components. Cases considered were: injection of only hot protons and hot electrons (no cold plasma), injection of cold protons (plasmapause movements), and injection of cold ions with different masses.
ESRO

N75-17032# Innsbruck Univ. (Austria). Inst. fuer Weltraumforschung.
A MODEL OF THE MAGNETOPAUSE USING AN ANGULAR DISTRIBUTION FUNCTION FOR INCIDENT PARTICLES
F. Cap and M. Leubner May 1974 12 p refs Submitted for publication
(UNICP-AR-4) Avail: NTIS HC $3.25

A modified theoretical model of the magnetopause in the noon-midnight meridian plane is proposed. A pressure balance equation is given which takes into consideration both the theory of Beard for parallel incident solar wind particles and the turbulent plasma in the magnetosheath using an angular distribution function. A variation of the intensities of the two different particle streams shows the effect of nonparallel incident particles on the shape of the magnetopause in the meridian plane. The geomagnetic latitude of the neutral points decreases with increasing density of particles having an angular distribution. Author (ESRO)

N75-17033# Innsbruck Univ. (Austria). Inst. fuer Weltraumforschung.
THE MERIDIAN PLANE OF THE MAGNETOPAUSE FOR THE TILTED DIPOLE USING AN ANGULAR DISTRIBUTION FUNCTION FOR THE INCIDENT PARTICLES
F. P. Stoessel Jul. 1974 16 p refs Revised
(UNICP-AR-5-Rev) Avail: NTIS HC $3.25

The effects of various tilt angles of the geomagnetic dipole, assumed perpendicular to the earth-sun line, on the Mead and Beard model of the magnetopause, modified by Cap and Leubner

on the assumption of an angular distribution function for the stream of incident particles due to magnetosheath turbulence were investigated. The pressure balance equation including tilt angle and angular distribution function was solved numerically for the meridional plane. Quantitative results are discussed and compared with observations and the theory for parallel incident particles. Author (ESRO)

N75-17034# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
VERTICAL PROPAGATION OF TIME-DEPENDENT ELECTRIC FIELDS IN THE ATMOSPHERE AND IONOSPHERE
Rolf Bostroem and Ulf Fahleson Aug. 1974 22 p refs Presented at Fifth Intern. Conf. on Atmospheric Elec., Garmisch-Partenkirchen, West Ger., 2-7 Sep. 1974 Submitted for publication
(TRITA-EPP-74-18) Avail: NTIS HC $3.25

It is shown how problems involving time-dependent fields can be solved taking into account displacement currents and induction (non-potential) fields, as well as the anisotropy and frequency dependence of the complex ionospheric conductivity. Results referring to fields in the form of sinusoidal traveling or standing waves are given, and it is shown that fields of a horizontal scale of about 100 km or more penetrate from above to balloon altitudes (30 to 40 km) with little damping provided the temporal variation is slower than 1 second. Fields of a horizontal scale of 1 km penetrate from above only to the E-layer with little damping for time-independent fields and the damping becomes substantial for time-dependent fields even for periods as long as 1 hour. The field response upon a transient change in the source was also studied. Author (ESRO)

N75-16919* Scientific Translation Service, Santa Barbara, Calif.
ON THE LIDAR DETERMINATION OF ATMOSPHERIC TRANSMITTANCE
V. D. Stepanenko and V. V. Vasiliev *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 134-143 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 101-108 (For availability see N75-16904 08-42)
CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-17035 British Library Lending Div., Boston Spa (England).
LONG-RANGE FORECASTING: THE POSSIBILITIES AND OUTLOOK
F. Baur 1974 34 p refs Transl. into ENGLISH from VDI (Ver. Deut. Ing.) Z. (Germany), v. 115, no., 11 1973 p 863-874 In ENGLISH and GERMAN
(BLL-M-23294-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

A statistical approach for weather forecasting is discussed, and controlled by the concepts of probability theory. It is shown that the long range weather forecast can only be made on the basis of statistics which embrace the entire complex atmospheric process. It is concluded that few people do both- observe nature and listen to the scientific forecasts. M.C.F.

N75-17036 British Library Lending Div., Boston Spa (England).
THE RESULTS OF INTERNATIONAL COMPARISONS OF AEROLOGICAL RADIO-SONDES OF SAMPLE TYPE
V. I. Sljahov and A. F. Kuzenkov [1974] 14 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 4, 1973 p 94-98 In RUSSIAN and ENGLISH
(BLL-M-23462-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Aerological radiosondes of trial design from the U.S.S.R., Finland and Japan were compared. The accuracy of the trial radiosondes is shown to be acceptable for their use as standard instruments in estimating the errors inherent in the various national instruments making aerological soundings. Author

N75-17037 British Library Lending Div., Boston Spa (England).
A COMPUTER PROGRAMME FOR CALCULATING AND PLOTTING ISOLINES
A. G. Kornienko [1974] 9 p refs Transl. into ENGLISH from Gidronet Nauc-Issled. Cent. SSSR (Leningrad), v. 60, 1972 p 92-96 In RUSSIAN and ENGLISH
(BLL-M-23463-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Algorithms are presented for a computer program designed to calculate and arrange isoline points. The stages of the computational process are outlined and illustrated with a block diagram. N.E.R.

N75-17038 British Library Lending Div., Boston Spa (England).
SOME POSSIBLE WAYS OF FORMING STANDARD MESSAGES AUTOMATICALLY AND CONTROLLING THE TRANSMISSION OF METEOROLOGICAL MESSAGES
V. I. Zubkov [1974] 8 p refs Transl. into ENGLISH from Gidromet. Nauc-Issled. Cent. SSSR (Leningrad), v. 59, 1971 p 89-92 In RUSSIAN and ENGLISH
(BLL-M-23464-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The aim of ensuring that hydrometerological information be exchanged fully with the required swiftness within the existing telegraphic system has necessitated its calculation and control under transmission. A solution is presented to this problem using automatic decipherment of the start of the message, and short-term storage during transmission of service information on serial order and transmission time ensures that calculation and control are operationally satisfactory and have a sufficient reliability. This may be achieved through employing a circuit with an electronic transmitter in place of the existing electromechanical T-53, together with a circuit for transforming the periodic information of the time and serial number of the message, as input from electronic timers and the transmitter circuit. Author

N75-17039 British Library Lending Div., Boston Spa (England).
TESTING AND WORKING UP PHENOLOGICAL DATA WITH THE AID OF AN ELECTRONIC DATA PROCESSING FACILITY
R. Pfau [1974] 33 p refs Transl. into ENGLISH from Meteorol. Rdsch. (Offenbach), v. 26, 1973 p 69-80
(BLL-M-23401-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Phenological reports were processed to obtain means and extremes, and the frequency distributions of meteorological elements within phenologically limited intervals of time. The phenological material was archived in a modern data storage unit and provides a means of producing a large number of phenological charts. It was found that producing phenological charts with the aid of electronic data processing can produce only generalized charts as a first approximation; these charts enable the inference of a representative phenological date or the duration of the interval delimited by phenological indications for synoptic or climatological stations and their immediate surroundings. M.J.S.

N75-17040 British Library Lending Div., Boston Spa (England).
FORECASTING AIR TEMPERATURE VARIATION ONE MONTH AHEAD
E. G. Apasova [1974] 9 p refs Transl. into ENGLISH from Gidromet. Nauc.-Issled. Cent. (Leningrad), no. 115, 1973 p 3-7
(BLL-M-23402-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Long range weather forecasting is discussed to determine air temperature, one month in advance. Variations in the monthly temperature provide for the mean monthly temperature. It is shown that the climatic features of heat and cold waves, studied in the course of the month, are a considerable factor in determining the mean monthly temperature. M.C.F.

N75-17041*# Maryland Univ., College Park. Computer Science Center.
FOURIER TRANSFORM TECHNIQUES FOR THE INFERENCE OF CLOUD MOTION Final Technical Report, Oct. 1972 - Dec. 1974
R. C. Lo and A. Rosenfeld Dec. 1974 5 p refs

(Grant NGR-21-002-378)
(NASA-CR-142077) Avail: NTIS HC $3.25 CSCL 04B

The development and evaluation are reported of phase shift techniques based on the Fourier transform for the estimation of cloud motion from geosynchronous meteorological satellite photographs. An alternative approach to cloud motion estimation, involving thresholding, was proposed and studied. Author

N75-17042*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NORMAL PROBABILITIES FOR VANDENBERG AFB WIND COMPONENTS - MONTHLY REFERENCE PERIODS FOR ALL FLIGHT AZIMUTHS, 0- TO 70-km ALTITUDES
L. W. Falls Jan. 1975 172 p refs
(NASA-TM-X-64897) Avail: NTIS HC $6.25 CSCL 04B

Vandenberg Air Force Base (AFB), California, wind component statistics are presented to be used for aerospace engineering applications that require component wind probabilities for various flight azimuths and selected altitudes. The normal (Gaussian) distribution is presented as a statistical model to represent component winds at Vandenberg AFB. Head tail, and crosswind components are tabulated for all flight azimuths for altitudes from 0 to 70 km by monthly reference periods. Wind components are given for 11 selected percentiles ranging from 0.135 percent to 99.865 percent for each month. The results of statistical goodness-of-fit tests are presented to verify the use of the Gaussian distribution as an adequate model to represent component winds at Vandenberg AFB. Author

N75-17043*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A RADIOSONDE THERMAL SENSOR TECHNIQUE FOR MEASUREMENT OF ATMOSPHERIC TURBULENCE
Jack L. Bufton Washington Feb. 1975 44 p refs
(NASA-TN-D-7867; G-7443) Avail: NTIS HC $3.75 CSCL 04B

A new system was developed to measure vertical profiles of microthermal turbulence in the free atmosphere. It combines thermal sensor technology with radiosonde balloon systems. The resultant data set from each thermosonde flight is a profile of the strength and distribution of microthermal fluctuations which act as tracers for turbulence. The optical strength of this turbulence is computed and used to predict optical and laser beam propagation statistics. A description of the flight payload, examples of turbulence profiles, and comparison with simultaneous stellar observations are included. Author

N75-17044# Miami Univ., Coral Gables, Fla. Remote Sensing Lab.
QUANTIZING 3- AND 5-cm RADAR HURRICANE PRECIPITATION DATA Final Report
H. V. Senn Dec. 1974 26 p refs
(Contract NOAA-03-4-022-98)
Avail: NTIS HC $3.75

The radar video tape recording experiment in hurricanes was continued by reading out data onto PPI scopes with seven levels of video. Equipment and data problems are detailed and plans to digitize and computer process the tape are outlined. Methods of correcting data from airborne radars for attenuation are presented for hurricanes. A cross check on radar measurements, better attenuation estimates, and a better understanding of the Z, R relationship for varying precipitation rates provided. The methods are applicable only after the research data are computer processed. Author

N75-17045# World Meteorological Organization, Geneva (Switzerland).
A SURVEY OF METEOROLOGICAL AND HYDROLOGICAL DATA AVAILABLE IN SIX SAHELIAN COUNTRIES OF WEST AFRICA. A SURVEY OF STUDIES IN METEOROLOGY AND HYDROLOGY IN THE SUDANO-SAHELIAN ZONE OF WEST AFRICA
E. G. Davy 1974 125 p Partly in ENGLISH and partly in FRENCH
(WMO-379) Avail: NTIS HC $5.25

A meteorological and hydrological survey was made in six West African countries, namely, Upper Sahel, Upper Volta, Mali, Mauritania, Niger, Senegal, and Chad. The survey was carried out in conjunction with an economic development program particularly oriented to the severe drought problem of the Sahelan regions. Urgent investigation is needed in four areas: weather/crop correlations, weather/run-off correlations and maps of agricultural and water resources potential, periodic recurrence and persistence of rainfall, and droughts in relation to general atmospheric circulation. A list of stations and their services is included. ESRO

N75-17046# World Meteorological Organization, Geneva (Switzerland).
THE STORAGE, CATALOGUING AND RETRIEVAL OF METEOROLOGICAL INFORMATION
J. M. Craddock 1974 250 p
(WMO-366; WWW-PLR-34) Avail: NTIS HC $7.50

The design of a computerized cataloging system for an international meteorological data bank is examined in considerable detail. Specific instructions and examples are provided. The general purpose cataloging and retrieval program is implemented in universal Fortran, for which a generalized flow diagram is given. The system flexibility allows both a low level comprehensive catalog and a high level selective catalog to be developed using the same retrieval language with upgrading of entries whenever resources permit. ESRO

N75-17047# World Meteorological Organization, Geneva (Switzerland).
A BRIEF SURVEY OF METEOROLOGY AS RELATED TO THE BIOSPHERE
C. C. Wallen 1974 62 p refs
(WMO-372; SER-4) Avail: NTIS HC $4.25

The dependence of ecosystems of various scales from meteorological processes, together with the changes of climate occurring in these systems, are described. Meteorological factors included in mathematical models of ecosystems are analyzed. The world meteorological activities are referred to in these fields. Recent views on the possible impact of human activities in raising air pollution and on regional and global climates are discussed, also in annexion the present state of climate modification. The involvement of meteorology with ocean and inland water life is briefly described. ESRO

N75-17048# Stockholm Univ. (Sweden). Inst. of Meteorology.
SOME EXPLORATORY EXPERIMENTS WITH A NEW TYPE OF ROTATING, DIFFERENTIALLY-HEATED FLUID ANNULUS
Peter A. Davies and Goesta Walin 30 May 1974 73 p refs Sponsored in part by the Roy. Soc. and Intern. Meteorol. Inst.
(Contract SWEDSRC-G-0223-052)
(GH-5) Avail: NTIS HC $4.25

With suitable construction of the annulus, the strength of the zonal baroclinic motion may be chosen independently of the basic density stratification. It was found that the baroclinic instability occurred in a state characterized by small isotherm slopes. Certain aspects of the observed flow and temperature fields, in particular, the basic stratification and the slope of the isotherms, are compared. Certain basic difficulties associated with the sensitivity of the baroclinic flow to small changes in the boundary conditions are discussed. Author (ESRO)

N75-17049# Royal Netherlands Meteorological Inst., De Bilt.
OBSERVATIONS OF SOIL TEMPERATURE IN THE DELTA AREA, AUGUST 1962 - APRIL 1973 [WAARNEMINGEN VAN DE GROND TEMPERATUUR IN HET DELTAGEBIED, AUGUSTUS 1962 - APRIL 1973]
P. C. T. vanderHoeven 1974 53 p refs
(KNMI-WR-74-14) Avail: NTIS HC $4.25

A survey is presented of soil temperature measurements in the south-western part of the Netherlands over a period of eleven years. The consistency of these data was investigated. It is shown that the regime of temperature in the ground, in connection with the prevailing weather, is entirely determined by the place of measurement itself. It was found that, due to the lack of advection, the most remote stations have a similar regime of soil temperature. ESRO

N75-17050# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
WEATHER MODIFICATION: A PILOT PROJECT Final Report
Lewis O. Grant, Charles F. Chappell, Loren W. Crow, J. Michael Fritsch, and Paul W. Mielke, Jr. Feb. 1974 76 p refs
(Contract DI-14-06-D-6467)
(PB-237085/6; REC-14-06-D-6467) Avail: NTIS HC $4.75 CSCL 04B

The research concerns the preparation of a design program to apply results from experimental programs for augmenting orographic precipitation to a Pilot Project that would have the goal of providing sound scientific and engineering evaluation of precipitation increases over a large area by operational-type application of cloud seeding techniques. The report describes: (1) the purpose of the project; (2) the scientific and technological basis; (3) the design constraints; and (4) the details of the design. The experimental hypothesis, the site selection, the experimental procedures, the data collection requirements, the operations procedures and the evaluation techniques are all included in the design. GRA

N75-17051# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
CHARACTERISTICS OF TROPICAL SQUALL-LINES OVER VENEZUELA M.S. Thesis
Ralph W. Grover Jul. 1974 91 p refs
(Grant NSF GA-33182)
(PB-236763/9; AS-Paper-228) Avail: NTIS HC $4.75 CSCL 04B

The characteristics of fifteen mesoscale storm systems observed during the 1972 Venezuelan International Meteorological and Hydrological Experiment were compared with the predictions of a dynamic cumulonimbus and squall-line model proposed by Moncrieff (1974a). The fifteen systems seemed to fall into three groups: one group of six were land tropical squall-lines; a second group of seven are simply called non-squall-lines; and the third group of two storms formed a distinct class which are here called large non-propagating mesosystems. Moncrieff's theoretical model, which predicts storm propagation speeds, is applied to each group, and closest agreement is found with the group of squall-lines. A simple composite of the inflow and outflow environments of the squall-lines is presented. This shows the complete dynamic and thermodynamic transformation of the atmosphere, which, as predicted by the theory, results from the passage of a squall-line. A schematic model for a squall-line is presented from this composite. (Modified author abstract) GRA

N75-16905* Scientific Translation Service, Santa Barbara, Calif.
REFINEMENT OF THE BASIC RADAR EQUATION FOR CLOUDS AND PRECIPITATION
Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 1-6 refs Transl. into ENGLISH from the book "Rapiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 3-7 (For availability see N75-16904 08-42)
CSCL 04B

N75-16907* Scientific Translation Service, Santa Barbara, Calif.
THE INFLUENCE OF INHOMOGENEITY OF THE REFLECTIVITY DISTRIBUTION ON THE ACCURACY OF ITS MEASUREMENT
Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 14-19 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 14-18 (For availability see N75-16904 08-42)
CSCL 04B

N75-16908* Scientific Translation Service, Santa Barbara, Calif.
ON THE ERRORS IN USING THE RAYLEIGH APPROXIMATION FOR ESTIMATING THE REFLECTIVITY OF CLOUDS AND PRECIPITATION
Ye. M. Salman and B. M. Yerukhimovich *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 20-27 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 19-25 (For availability see N75-16904 08-42)
CSCL 04B

N75-16909* Scientific Translation Service, Santa Barbara, Calif.
PROBABILITY DISTRIBUTION FUNCTIONS OF ECHO SIGNALS FROM METEOROLOGICAL TARGETS
G. V. Vasilyev *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 28-38 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 26-33 (For availability see N75-16904 08-42)
CSCL 04B

N75-16910* Scientific Translation Service, Santa Barbara, Calif.
RADAR CHARACTERISTICS OF CLOUD FIELDS
B. Sh. Divinskaya *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 39-57 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 34-47 (For availability see N75-16904 08-42)
CSCL 04B

N75-16911* Scientific Translation Service, Santa Barbara, Calif.
METHODS OF DISCRIMINATING CLOUD SYSTEMS BY THEIR RADAR CHARACTERISTICS
B. Sh. Divinskaya *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 58-71 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 48-57 (For availability see N75-16904 08-42)
CSCL 04B

N75-16912* Scientific Translation Service, Santa Barbara, Calif.
THE PROBLEM OF REGIME SUMMARIES OF THE DATA FROM RADAR OBSERVATIONS
B. Sh. Divinskaya and Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 72-81 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 58-63 (For availability see N75-16904 08-42)
CSCL 04B

N75-16913* Scientific Translation Service, Santa Barbara, Calif.
OPTIMAL FORM AND FREQUENCY OF PRESENTATION OF RADAR DATA ON CLOUDS AND PHENOMENA CONNECTED WITH THEM
Ye. M. Salman and B. Sh. Divinskaya *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 82-94 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 65-74 (For availability see N75-16904 08-42)
CSCL 04B

N75-16914* Scientific Translation Service, Santa Barbara, Calif.
ON THE PROBLEM OF ADJUSTING THE CRITERION FOR DISCRIMINATING PHENOMENA ACCOMPANYING SUMMERTIME Cb
S. B. Gashina, T. D. Kotova, L. I. Kuznetsova, and Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 95-104 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 75-81 (For availability see N75-16904 08-42)
CSCL 04B

N75-16915* Scientific Translation Service, Santa Barbara, Calif.
ON A POSSIBLE METHOD FOR DAILY ADJUSTMENT OF SEVERE STORM RADAR CRITERIA
G. B. Brylev and Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 105-110 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 82-85 (For availability see N75-16904 08-42)
CSCL 04B

N75-16916* Scientific Translation Service, Santa Barbara, Calif.
COMPARATIVE ESTIMATE OF THE EFFECTIVENESS OF DIFFERENT ALGORITHMS FOR THE RADAR CLASSIFICATION OF THUNDERSTORMS AND SHOWERS
A. G. Linev, V. S. Oprishko, N. D. Popova, and Ye. M. Salman *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 111-116 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 86-89 (For availability see N75-16904 08-42)
CSCL 04B

N75-16917* Scientific Translation Service, Santa Barbara, Calif.
A COMPARISON OF INFORMATION ON CLOUDS AND PHENOMENA ACCOMPANYING Cb OBTAINED FROM SURFACE AND RADAR NET STATIONS
S. B. Gashina, L. I. Matveyeva, and A. A. Razumovskiy *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 117-124 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 90-94 (For availability see N75-16904 08-42)
CSCL 04B

N75-16918* Scientific Translation Service, Santa Barbara, Calif.
ON THE PROBLEM OF RADAR EFFECTIVENESS OF DISCRIMINATING THUNDERSTORMS AND CLOUDS
P. A. Allenov and R. M. Zrazhevskaya *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 125-133 Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 95-100 (For availability see N75-16904 08-42)
CSCL 04B

N75-16923 Joint Publications Research Service, Arlington, Va.
EFFECT OF LARGE CITIES ON THE METEOROLOGICAL REGIME
Kh. P. Pogosyan *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 1-7 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 3-8 Presented at the Plenary Session of the All-Union Interdepartmental Conf. on the Climate, City and Man, Moscow, 18-22 Sep. 1973 (For availability see N75-16922 08-42)

N75-16924 Joint Publications Research Service, Arlington, Va.
PROBLEM OF PARAMETERIZING THE PROCESS OF THE TRANSFER OF RADIANT SOLAR ENERGY TO THE OCEAN-ATMOSPHERE SYSTEM AND LONG RANGE FORECASTING
Sh. A. Musayelyan *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 8-20 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 9-19 Presented at the Conf. on Long Range Weather Forecasting Tech., Moscow, 22-24 Jan. 1974 (For availability see N75-16922 08-42)

N75-16925 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF THE INTERYEAR AIR TEMPERATURE FLUCTUATIONS
N. A. Lepekhina and I. I. Polyak *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 21-28 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 20-25 (For availability see N75-16922 08-42)

N75-16926 Joint Publications Research Service, Arlington, Va.
PERIODIC VARIATIONS OF THE WIND VELOCITY IN THE LOWER THERMOSPHERE, THE STRATOSPHERE AND THE TROPOSPHERE IN THE WINTER
I. A. Lysenko, M. A. Petrosyants, Yu. I. Portnyagin, and L. V. Szetogorova *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 29-35 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 26-31 (For availability see N75-16922 08-42)

N75-16927 Joint Publications Research Service, Arlington, Va.
VERTICAL WIND SHIFTS IN THE BOUNDARY LAYER OF THE ATMOSPHERE (ACCORDING TO EXPERIMENTAL DATA)
L. R. Orlenko and O. B. Shklyarevich *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 36-48 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 32-40 (For availability see N75-16922 08-42)

N75-16928 Joint Publications Research Service, Arlington, Va.
WIND VECTOR IN THE LAYER NEXT TO THE WATER
Ye. K. Korchagin, R. N. Semenov, and I. A. Mandurovskiy *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 49-58 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 41-48 (For availability see N75-16922 08-42)

N75-16930 Joint Publications Research Service, Arlington, Va.
CALCULATING THE CHARACTERISTICS OF THE BOUNDARY LAYERS OF THE OCEAN AND ATMOSPHERE CONSIDERING THEIR INTEGRATION
Yu. D. Resnyanskiy *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 69-80 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 58-66 (For availability see N75-16922 08-42)

N75-16934 Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF EXPERIMENTAL STUDIES OF SMALL SCALE TURBULENCE IN THE MIDDLE TROPOSPHERE (TROPEX-72)
N. Z. Pinus and V. K. Dmitriyev *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 110-119 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 89-96 (For availability see N75-16922 08-42)

N75-16935 Joint Publications Research Service, Arlington, Va.
CALCULATING THE WIND FIELD ABOVE THE OCEANS
L. A. Golodko and V. M. Radikevich *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 120-129 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 97-102 (For availability see N75-16922 08-42)

N75-16936 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF EXPERIMENTAL DATA ON THE WIND ON THE BALTIC SEA
N. A. Lavrov *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 130-133 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 102-104 (For availability see N75-16922 08-42)

N75-16939 Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL CONDITIONS ON THE INTERNATIONAL AIR LANES
V. M. Kosenko *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 156-157 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 117-119 (For availability see N75-16922 08-42)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography, and marine resources.

N75-17052# National Environmental Satellite Service, Washington, D.C.
POTENTIAL VALUE OF EARTH SATELLITE MEASUREMENTS TO OCEANOGRAPHIC RESEARCH IN THE SOUTHERN OCEAN
E. Paul McClain Jan. 1975 23 p refs
(NOAA-TM-NESS-61) Avail: NTIS HC $3.25

Methods to improve the mapping and monitoring of icepack concentration, character, and condition from satellite observations in the visible, near infrared, and thermal infrared parts of the spectrum are reviewed along with techniques developed to map sea surface temperatures and temperature gradients on regional and hemispheric scales from space. Examples of NOAA and ERTS measurements, higher in spectral and spatial resolution than those previously available, and of measurements from the passive microwave imager aboard Nimbus 5 and their applications are presented. A brief discussion of future sensor systems expected to be of interest to Southern Ocean researchers is given. Author

N75-17053*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DATA REPORT OF SIX FREE-DRIFTING BUOYS TRACKED BY THE EOLE SATELLITE IN THE WESTERN NORTH ATLANTIC OCEAN IN THE AUTUMN OF 1972
J. W. Usry and J. W. Wallace 1972 49 p refs
(NASA-TM-X-72645) Avail: NTIS HC $3.75

The buoys were deployed on the Continental Shelf east of the Chesapeake Light and were tracked by the French EOLE satellite. Two buoys drifted for 11 days during the first mission

and four buoys drifted for 14 days during the second mission. Trajectory and water temperature data are presented in tabular and graphical from with a discussion of the accuracy. Author

N75-17054# Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory.
MIXING, DIFFUSION, AND CIRCULATION RATES IN OCEAN WATERS Annual Report, Jul. 1973 - Jun. 1974
W. S. Broecker and R. D. Gerard Jun. 1974 205 p refs
(Contract AT(11-1)-2185)
(COO-2185-6) Avail: NTIS HC

Field studies on ocean circulation are described. Major emphasis is placed on: (1) examination of Mediterranean outflow; (2) examination of the circulation between the eastern and western Atlantic basins; (3) intensive studies of the Antarctic circulation south east of South Africa; (4) oceanographic studies in the eastern equatorial Pacific; (5) analysis of deep ocean tide data from an ocean bottom tide meter; and (6) summarization of the results of coastal circulation studies in the New York bight.
J.M.S.

N75-17055# Woods Hole Oceanographic Institution, Mass.
HEAT LOSS AND HYDROTHERMAL CIRCULATION DUE TO SEA-FLOOR SPREADING
David Lee Williams Jul. 1974 142 p refs
(Grant NSF GA-16078)
(PB-237014/6; WHOI-74-51) Avail: NTIS HC $5.75 CSCL 08J

Lithospheric cooling along the Galapagos Spreading Center at 86 degrees W longitude, as determined by surface heat-flow measurements, appears dominated by hydrothermal circulation. This same phenomenon apparently exists on the Mid-Atlantic Ridge at 36 degrees N and presumably, in some form on all active oceanic ridges. It is responsible for removing the majority of the heat lost through young oceanic crust. A theoretical expression is used to estimate the heat released by sea-floor spreading.
GRA

N75-16931 Joint Publications Research Service, Arlington, Va.
VERTICAL STRUCTURE OF THE MAIN OCEAN THERMOCLINE
V. S. Maderich *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 81-90 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 67-74 (For availability see N75-16922 08-42)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-17056 British Library Lending Div., Boston Spa (England).
BIOSATELLITE: RESULTS OF AN EXPERIMENT
O. Gazenko [1974] 6 p Transl. into ENGLISH from the Russian
(BLL-M-23466-(5828.4F)) Avail: British Library Lending Div., Boston Spa., Engl.: 1 BLL photocopy coupon

The Cosmos 605 satellite carrying white rats, tortoises, insects, microorganisms and fungi, landed on the earth, bringing back valuable information from its 22-day-long flight. Postflight evaluation of weightlessness stress effects on rats established an inhibition of weight gain, reduced oxygen consumption and body temperatures, inhibition of oxidative phosphorylation in skeletal muscles, changes in enzyme activity in the tissues of the heart muscle, the skeletal muscles, the liver, the kidneys and in endocrine glands, as well as disturbance of the fatty metabolism. Also demonstrated was reduction in lymphocytes and reticulocytes, and an increase in eosinophils in the peripheral blood.
G.G.

N75-17057*# Techtran Corp., Glen Burnie, Md.
EFFECT OF EXTREMAL FACTORS ON THE STRUCTURE OF THE ORGANS AND TISSUES
M. G. Prives, ed. and S. S. Mikhaylov, ed. Washington NASA Feb. 1975 93 p refs Transl. into ENGLISH of the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 1-95
(Contract NASw-2485)
(NASA-TT-F-791) Avail: NTIS HC $4.75 CSCL 06C

High altitude and spaceflight stress effects on animal organs and tissues are studied by observing physiological responses to g-forces, hypokinesia, and radiation. For individual titles, see N75-17058 through N75-17073.

N75-17058* Techtran Corp., Glen Burnie, Md.
ADAPTATION OF THE VASCULAR SYSTEM TO EXTREMAL FACTORS
M. G. Prives *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 1-8 refs Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 3-13 (For availability see N75-17057 08-51)
CSCL 06C

Exposure to g-forces causes changes in the vascular systems of animals. The vessels are distorted and their contents may escape. Various parts of a given organ may react differently according to their structure, and arteries will undergo changes that depend on their position relative to the direction of the g-force vector.
Author

N75-17059* Techtran Corp., Glen Burnie, Md.
INFLUENCE OF G-FORCES ON THE BLOOD VESSELS IN THE NERVOUS SYSTEM OF THE RABBIT
N. I. Zotova, V. A. Muratikova, and I. N. Preobrazhenskaya *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 9-13 refs Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 14-18 (For availability see N75-17057 08-51)
CSCL 06C

Arteries in the brain are constricted by g-forces applied in the head-pelvis direction. Transversely applied g-forces have less effect. Appropriate conditioning can reduce the severity of all g-force applications.
Author

N75-17060* Techtran Corp., Glen Burnie, Md.
INFLUENCE OF G-FORCES ON THE VESSELS IN THE RETINA, KIDNEY AND UTERUS OF THE RABBIT
Ye. A. Belyayeva, L. I. Savinova, and L. M. Selivanova *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 15-17 Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 19-24 (For availability see N75-17057 08-51)
CSCL 06C

The vascular system of the retina, uterus, and kidneys is highly resistant to the effects of exposure to g-forces. The uterine vessels recover more rapidly than those in the retina and kidneys.
Author

N75-17061* Techtran Corp., Glen Burnie, Md.
INFLUENCE OF G-FORCES AND HYPODYNAMIA ON THE PORTAL SYSTEM OF THE LIVER
A. V. Drozdova *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 18-22 Transl. into ENGLISH from the book "Vliyaniyd Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 25-28 (For availability see N75-17057 08-51)
CSCL 06C

Longitudinally and transversely applied g-forces as intolerable levels cause damage to the interlobular veins of the liver, with maximum damage caused by dorso-ventral g-force application. The portal vein system is more resilient with respect to g-forces at the limit of tolerance.
Author

N75-17062* Techtran Corp., Glen Burnie, Md.
INFLUENCE OF G-FORCES ON THE NEURORECEPTOR APPARATUS OF THE CARDIOVASCULAR SYSTEM
S. S. Mikhaylov, V. K. Klebanov, and S. I. Yevloyev *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 23-32 refs Transl. into ENGLISH from the book "Vliyaniya Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 29-41 (For availability see N75-17057 08-51)
CSCL 06C

Morphological and functional changes occur in the nerve apparatus of the cardiovascular system during exposure to g-forces. They are reversible at lower magnitudes but not at higher ones. Author

N75-17063* Techtran Corp., Glen Burnie, Md.
HISTOLOGICAL ANALYSIS OF TISSUE STRUCTURES OF THE INTERNAL ORGANS OF STEPPE TORTOISES FOLLOWING THEIR EXPOSURE TO SPACEFLIGHT CONDITIONS WHILE CIRCUMNAVIGATING THE MOON ABOARD THE ZOND-7 AUTOMATIC STATION
L. S. Sutulov, Yu. L. Sutulov, and L. V. Trukhina *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 33-36 Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 42-44 (For availability see N75-17057 08-51)
CSCL 06C

Tortoises flown around the Moon on the 6-1/2 day voyage of the Zond-7 automatic space station evidently did not suffer any pathological changes to their peripheral blood picture, heart, lungs, intestines, or liver. Author

N75-17064* Techtran Corp., Glen Burnie, Md.
INFLUENCE OF G-FORCES ON VENOUS AND NERVOUS SYSTEMS
Ye. A. Dyskin, R. A. Prives-Bardina, and L. P. Tikhonova *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 37-41 Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 45-49 (For availability see N75-17057 08-51)
CSCL 06C

Cats and rabbits were subjected to rotation in the centrifuge. Controls were maintained to determine the individual tolerance to g-forces. Thickening of the vascular wall was found to occur due to the g-forces' effect, as well as other vascular changes. Nervous changes included edema and chromatolysis of the nerve cells. Author

N75-17065* Techtran Corp., Glen Burnie, Md.
DYNAMICS OF MORPHOLOGICAL MANIFESTATIONS OF REACTIONS OF THE ORGANISM UNDER CONDITIONS OF HYPERGRAVITATION
G. D. Knyazeva, V. K. Podymov, and Ye. A. Savina *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 42-45 Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 51-55 (For availability see N75-17057 08-51)
CSCL 06C

The dynamics of the reaction of the hypothalamus-hypophysis-adrenal system to g-forces of 4 G's magnitude reveal a phasal nature of the adaptational system, dependent both on duration of force and position of the body. Author

N75-17066* Techtran Corp., Glen Burnie, Md.
MORPHOLOGICAL MANIFESTATIONS OF THE STRESS REACTION UNDER THE INFLUENCE OF TRANSVERSELY DIRECTED G-FORCES
V. P. Derevyanko, Yu. N. Kopayev, and Yu. V. Mashkovtsev *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 46-50 refs Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroveniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 56-61 (For availability see N75-17057 08-51)
CSCL 06C

Multiple exposure to g-forces evokes alarm reactions in animals which are reflected in increased secretion from the ACTH cells and adrenocorticocytes, with increased lymphocytolysis and suppressed mitotic activity. Author

N75-17067* Techtran Corp., Glen Burnie, Md.
INVESTIGATION OF CARBOHYDRATE AND PROTEIN METABOLISM IN THE DIGESTIVE ORGANS OF THE RABBIT UNDER THE COMBINED INFLUENCE OF VIBRATION, ACCELERATION AND IRRADIATION
R. I. Yuy *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 51-54 Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 62-65 (For availability see N75-17057 08-51)

During spaceflight, the organism is subjected to the influence of various extremal factors such as acceleration, vibration, irradiation, etc. The study of the influence of these factors on metabolism, especially carbohydrate and protein metabolism, in young rabbits is of great significance in simulation experiments. Dynamic factors and irradiation, depending on dose and duration, lead to reduced RNA and protein metabolism. Author

N75-17068* Techtran Corp., Glen Burnie, Md.
MORPHOLOGICAL AND CYTOCHEMICAL INDICES OF THE STRESS REACTION IN THE BLOOD SYSTEM UNDER THE INFLUENCE OF G-FORCES
N. A. Yurina *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 55-58 refs Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 66-68 (For availability see N75-17057 08-51)
CSCL 06C

G-forces cause morphological and cytochemical changes characteristic of the stress reaction. The cytochemical changes in RNA content on lymphocytes, glycogen, and activity of oxidative enzymes in granulocytes are phasal in nature. Author

N75-17069* Techtran Corp., Glen Burnie, Md.
STRUCTURAL AND CYTOCHEMICAL INVESTIGATIONS OF THE GRAVITY RECEPTOR UNDER CONDITIONS OF RELATIVE REST AND FOLLOWING EXPOSURE TO ACCELERATIONS
M. Z. Aronova, L. K. Titova, and T. P. Tsirulis *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 59-62 refs Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 70-73 (For availability see N75-17057 08-51)

When investigating the influence of g-forces on vertebrates, a number of cytochemical and ultrastructural changes are observed: deflection of the stereocilia, change in concentration as well as the localization of a number of chemical biologically active substances, displacement of the mitochondria, their pressure against the membranes, the release into the cytoplasm of the ribosomes of nucleolar RNA, the formation of additional membranes in the cytoplasmatic network, etc. According to preliminary data, it is assumed that similar processes are observed in the gravity receptors of invertebrates as well. It is concluded that gravity receptors in vertebrates and invertebrates are strikingly similar despite different evolutionary paths. Author

N75-17070* Techtran Corp., Glen Burnie, Md.
INFLUENCE OF MAXIMUM TOLERABLE TRANSVERSELY-DIRECTED G-FORCES ON THE ULTRASTRUCTURE OF INTERCELLULAR AND INTRACELLULAR CHANNELS IN THE ADENOHYPOPHYSIS
V. S. Strizhkov *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 63-67 Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 74-79 (For availability see N75-17057 08-51)
CSCL 06C

Exposure of rats to g-forces of high magnitude results in changes in the ultrastructure of the intercellular channels of the adenohypophysis. Evidence indicates that the chromophobic cells in the walls of the channels and pseudofollicles exert a secretory activity. Author

N75-17071* Techtran Corp., Glen Burnie, Md.
HISTOLOGICAL ANALYSIS OF THE INFLUENCE OF CERTAIN EXTREMAL FACTORS ON THE POSTRADIATIONAL CHANGES IN THE TISSUES OF EXPERIMENTAL ANIMALS
L. S. Sutulov, N. A. Gaydamakin, and Yu. L. Sutulov *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 68-73 Transl. into ENGLISH from the book "Vliyaniya Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972

p 80-85 (For availability see N75-17057 08-51)

Protons with energies of 120 MeV at a dose of 640 rads or gamma-neutron radiation at a dose of 300 rads produce radiation sickness of moderate severity in rats. The significance of toxemia and disturbances to the endocrine regulatory system in the development of metabolic processes in various stages of radiation sickness are discussed. Author

N75-17072* Techtran Corp., Glen Burnie, Md.
MORPHOLOGY OF THE INTERNAL ORGANS IN THE ADAPTATION OF ANIMALS TO HIGH-ALTITUDE CONDITIONS
Ya. A. Rakhimov, V. Sh. Belkin, and M. U. Usmanov *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 74-78 Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 87-90 (For availability see N75-17057 08-51)
CSCL 06C

Disruption of metabolic processes in the walls of the blood vessels as well as changes in the functional activity of the endocrine glands play an important role in the process of an animal's accommodation to a combination of stress factors. Preliminary training of animals for stays at high-altitude markedly reduces the severity of the morphological picture. Author

N75-17073* Techtran Corp., Glen Burnie, Md.
CHANGE IN THE INTRAORGANIC NERVE APPARATUSES OF MUSCLES UNDER CONDITIONS OF THE COMBINED ACTION OF A dc MAGNETIC FIELD AND ACCELERATION
V. P. Govev and G. V. Chepelenko *In its* Effect of Extremal Factors on the Struct. of the Organs and Tissues (NASA-TT-F-791) Feb. 1975 p 79-83 refs Transl. into ENGLISH from the book "Vliyaniye Ekstremalnykh Faktorov na Stroyeniye Organov i Tkaney" Moscow, Meditsina Press, 1972 p 91-95 (For availability see N75-17057 08-51)
CSCL 06C

Damage to neurons in the rat when the animals are subjected to a constant magnetic field is a function of their reactive capacity. The reactive stage is characterized by dystrophic changes without any definite signs of destruction of tissue. Author

N75-17074*# Scientific Translation Service, Santa Barbara, Calif.
CONTRIBUTION TO THE QUESTION OF THE CONTAMINATION OF SUSPENDED SUBSTANCES FILTERS BY GERMS
G. Reckzeh and W. Dontenwill Washington NASA Feb. 1975 20 p refs Transl. into ENGLISH from Zentralbl. Bakteriol. Parasitenk., Abt. 1 Orig. B (East Germany), v. 159, 1974 p 272-283
(Contract NASw-2483)
(NASA-TT-F-16149) Avail: NTIS HC $3.25 CSCL 06M

The germ-count of HEPA-filtered air and the germ content of HEPA filters in the air conditioning plant of an experimental animal department, constructed in accordance with the barrier system are reported. In the 888 samples routinely collected with slit samplers during the 26 months' operation of the filters, a total quantity of 503 cu m HEPA-filtered supply air was investigated. In these investigations, no germs were detected, either with slit samplers or on sedimentation plates. In measurements performed with Greenburg-Smith impingers on a total quantity of 20.4 cu m air, a total of 3 colonies of Staph. albus were detected in 2 out of 36 samples, but these should be regarded as contamination produced during the test procedure itself. Author

N75-17075*# Scientific Translation Service, Santa Barbara, Calif.
INHIBITION OF GERMINATION OF ACTINOMYCETES SPORES IN A STATIONARY MAGNETIC FIELD
R. R. Aslanyan, S. V. Tulskiy, L. M. Pozharitskaya, and Ye. A. Lapteva Washington NASA Feb. 1975 7 p refs Transl. into ENGLISH from Mikrobiologiya (USSR), v. 42, no. 3, p 556-558
(Contract NASw-2483)
(NASA-TT-F-16203) Avail: NTIS HC $3.25 CSCL 06C

Research exploring the reaction of biological systems to various components of electromagnetic radiation was conducted. It was found that a stationary magnetic field (10,000 ersted) inhibits the germination of the spores of Actinomyces streptomycini B-6 and Thermoactinomyces vulgaris 136. Author

N75-17076*# Kanner (Leo) Associates, Redwood City, Calif.
FREQUENCY OF DIFFERENTIATED SECTORED COLONIES AMONG BACTERIA IN SUSPENSION IN THE OUTSIDE AIR OBSERVED OVER THREE YEARS (ITS CORRELATION WITH VARIOUS PARAMETERS: WOLF'S NUMBERS, SOLAR FLUX, GEOMAGNETIC ACTIVITY, FLUCTUATING PHENOMENA
P. Faraone Washington NASA Feb. 1975 22 p refs Transl. into ENGLISH from Ann. Sclavo (Italy), v. 15, no. 2, Mar.-Apr. 1973 p 207-224
(NASA-TT-F-16202) Avail: NTIS HC $3.25 CSCL 06M

The incidence of the colonies with differentiated sectors among the bacteria suspended in the external air during three years has been studied. It seems probable that the frequency may be connected with many astrophysical factors, as for instance the fluctuating phenomena. Author

N75-17077*# Hawaii Univ., Honolulu. Botany Dept.
THE PERFORMANCE AND CAPABILITIES OF TERRESTRIAL ORGANISMS IN EXTREME AND UNUSUAL GASEOUS AND LIQUID ENVIRONMENTS Ph.D. Thesis. Semiannual Report
Sanford M. Siegel Nov. 1974 63 p refs
(Grant NGL-12-001-042)
(NASA-CR-142192; Rept-38) Avail: NTIS HC $4.25 CSCL 06M

The similarities and differences in salt and cold tolerance mechanisms of Dunaliella salina and Dunaliella tertiolecta are described. Author

N75-17078*# Catholic Univ. of America, Washington, D.C.
DATA PROCESSING PROGRAMS FOR NONLINEAR ANALYSIS OF AORTIC FLOW IN LIVING DOGS
S. C. Ling, H. B. Atabek, and W. G.04Patel Letzing, D. J. Aug. 1973 35 p Submitted for publication
(Grants NGL-09-005-067; HE-12083-05)
(NASA-CR-142085; PB-235997/4; NIH/NHLI/ATHERO-73-1) Avail: NTIS HC $3.75 CSCL 06P

A nonlinear theory which considered the convective accelerations of blood and the nonlinear elastic behavior and taper angle of the vascular wall was used to study the nature of blood flow in arteries of living dogs. The theory predicts velocity profiles, wall friction, and discharge wave from locally measured input data about the pressure-gradient wave and the arterial distention. Computer programs for performing the data reduction and calculation are presented. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-17079# Advisory Group for Aerospace Research and Development, Paris (France).
SURVEY OF CURRENT CARDIOVASCULAR AND RESPIRATORY EXAMINATION METHODS IN MEDICAL SELECTION AND CONTROL OF AIRCREW
A. Scano (Scoula Militare di Sanita Aeronautica, Roma) Dec. 1974 138 p refs
(AGARD-AG-196; AGARDograph-196) Avail: NTIS HC $5.75

Procedures for conducting the physical examination of aircrew personnel to determine the condition of cardiovascular and respiratory systems are discussed. The examination methods are identified by the country in which performed. Charts are developed which summarize the procedures with respect to: (1) the method used, (2) the aim, (3) the techniques for implementation, (4) the limits of reliability, (5) the weight conferred on each test, and (6) an evaluation of the results. P.N.F.

N75-17080*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB MEDICAL DATA CENTER AND ARCHIVES

Fred R. Spross Dec. 1974 13 p
(NASA-TM-X-58148; JSC-09293) Avail: NTIS HC $3.25 CSCL 06E

The founding of the Skylab medical data center and archives as a central area to house medical data from space flights is described. Skylab program strip charts, various daily reports and summaries, experiment reports and logs, status report on Skylab data quality, raw data digital tapes, processed data microfilm, and other Skylab documents are housed in the data center. In addition, this memorandum describes how the data center acted as a central point for the coordination of preflight and postflight baseline data and how it served as coordinator for all data processing through computation and analysis. Also described is a catalog identifying Skylab medical experiments and all related data currently archived in the data center. Author

N75-17081*# Texas A&M Univ., College Station. Engineering Experiment Station.
RADIATION EFFECTS CONTROL: EYES, SKIN Final Report, 1 Oct. 1969 - 31 Dec. 1974
Dan Hightower and J. B. Smathers Dec. 1974 148 p
(Contract NAS9-9053)
(NASA-CR-141612) Avail: NTIS HC $5.75 CSCL 06R

Adverse effects on the lens of the eye and the skin due to exposure to proton radiation during manned space flight were evaluated. Actual proton irradiation which might be encountered in space was simulated. Irradiation regimes included single acute exposures, daily fractionated exposures, and weekly fractionated exposures. Animals were exposed and then maintained and examined periodically until data sufficient to meet the objective were obtained. No significant skin effects were noted and no serious sight impairment was exhibited. Author

N75-17082*# Battelle Memorial Inst., Richland, Wash. Physics and Instrumentation Dept.
STUDY OF BONE MINERAL METABOLISM Final Report, 1 Jul. - 31 Dec. 1974
H. E. Palmer 13 Jan. 1975 17 p refs
(Contract NAS9-14248)
(NASA-CR-141608) Avail: NTIS HC $3.25 CSCL 06P

The use of Sr-85 as an indicator of the skeletal location and relative amount of bone demineralization which occurs during immobilization of the body or body parts, bed-rest or space flight was studied. The bone mineral replacement which occurs after immobilization was measured rather than the bone loss which occurs during immobilization. In a study with two adult beagle dogs, the Sr-85 uptake in a leg which had been immobilized for two months was 400 percent higher than the uptake in the legs in regular use. This increased uptake probably resulted from only a few percent loss in bone mineral and indicates that losses less than one percent can be easily detected and located. The sensitivity, simplicity, and low radiation dose associated with the use of this method indicates that it should receive consideration for use on humans in bed-rest and space flight studies. Methods for measuring changes in total body nitrogen and in assisting the Johnson Space Center in calibrating a whole body counter for total body potassium measurements were also investigated. Author

N75-17083*# Battelle Memorial Inst., Richland, Wash. Physics and Instrumentation Dept.
CONTINUED INVESTIGATION OF KINETIC ASPECTS OF BONE MINERAL METABOLISM Final Report, 1 Feb. 1973 - 28 Feb. 1974
H. E. Palmer 26 Feb. 1974 29 p refs
(Contract NAS9-13235)
(NASA-CR-141607) Avail: NTIS HC $3.75 CSCL 06P

The total body calcium in humans was determined by measuring expired Ar-37 after neutron irradiation. The excretion of Ar-37 from humans was found to be much slower than the excretion from rats and dogs, and to be related to the age of a person. A study of the uniformity of the Ar-37 production throughout the thickness of the body was studied using phantoms. The results indicate that it should be possible to obtain a uniformity within plus or minus 3% for the production of Ar-37 per unit of calcium by using a bilateral irradiation. New low background, large volume proportional counters were developed and constructed, for more sensitive measurement of Ar-37 in the expired air from patients. A new irradiation enclosure was developed for measuring total body calcium in rats by the Ar-37 method. With this enclosure the Ar-37 production per gram of calcium is constant with a standard deviation of plus or minus 2.8% for any size rat between 100 and 500 grams. The use of Na-22 as measure of bone replacement in the fractured femur of a dog was not successful. Author

N75-17084*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
DEVELOPMENT OF ULTRASONIC METHODS FOR HEMODYNAMIC MEASUREMENTS Progress Report
M. B. Histand, C. W. Miller, M. K. Wells, F. D. Mcleod, E. R. Greene, and D. Winter 1 Feb. 1975 115 p refs
(Grant NsG-2009)
(NASA-CR-141235) Avail: NTIS HC $5.25 CSCL 06D

A transcutanous method to measure instantaneous mean blood flow in peripheral arteries of the human body was defined. Transcutanous and implanted cuff ultrasound velocity measurements were evaluated, and the accuracies of velocity, flow, and diameter measurements were assessed for steady flow. Performance criteria were established for the pulsed Doppler velocity meter (PUDVM), and performance tests were conducted. Several improvements are suggested. N.E.R.

N75-17085*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE MISSION IN TASHKENT
A. Tankhelson and Sh. Zaynutdinov Washington NASA Feb. 1975 7 p Transl. into ENGLISH from Pravda Vostoka (USSR), 3 Nov. 1974 p 4
(Contract NASw-2481)
(NASA-TT-F-16161) Avail: NTIS HC $3.25 CSCL 06E

An account of the fifth conference of the joint Soviet-American Working Group on Space Biology and Medicine, held at Tashkent, is presented. Topics discussed the spaceflight results of Soviet research methods, and exchange of research reports. Author

N75-17086*# Scientific Translation Service, Santa Barbara, Calif.
A SCIENTIFIC CONFERENCE ON THE PROBLEM, HYPOXIA DURING PATHOLOGICAL PROCESSES CAUSED BY EXTREME FACTOR, DEVOTED TO THE 80TH BIRTHDAY OF ACADEMICIAN OF THE ACADEMY OF MEDICAL SCIENCES OF THE USSR
Ye. V. Gubler, Ye. V. Gubler, N. V. Korostovtseva, V. K. Kulagin, and B. R. Yaremenko Washington NASA Feb. 1975 11 p Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter. (USSR), no. 5, Sep. - Oct. 1974 p 92-94
(Contract NASw-2483)
(NASA-TT-F-16159) Avail: NTIS HC $3.25 CSCL 06E

A description is given of a scientific conference held in Leningrad on the topic of hypoxia during pathological processes. The conference was divided into four sessions, and the subjects of each session are itemized and discussed. Author

N75-17087# Civil Aeromedical Inst., Oklahoma City, Okla.
INDEX TO FAA OFFICE OF AVIATION MEDICINE REPORTS: 1961 THROUGH 1973
J. Robert Dille and Marcia H. Grimm Mar. 1974 30 p
(AD-779353; FAA-AM-74-1) Avail: NTIS HC $3.25

An indzx to Office of Aviation Medicine Reports (1964-73) and Civil Aeromedical Institute Reports (1961-63) is presented as a quick reference for those engaged in aviation medicine and related activities. It provides a listing of all FAA aviation medicine reports published from 1961 through 1973 by year, number, author, subject and title. Author

N75-17088# Oak Ridge National Lab., Tenn.
POPULATION EXPOSURES. PROCEEDINGS OF THE 8TH MIDYEAR TOPICAL SYMPOSIUM OF THE HEALTH PHYSICS SOCIETY
J. C. Hart, ed., R. H. Ritchie, ed., and B. S. Varnadore, ed. Oct. 1974 446 p refs Symp. held at Knoxville, Tenn., 21-24 Oct. 1974; sponsored by Comparative Animal Res. Lab., Oak Ridge Associated Univ., TVA, Union Carbide Corp. Nuclear Div., AEC, and Tennessee Univ. Sponsored by AEC
(Conf-741018) Avail: NTIS HC $11.25

Abstracts of the papers presented at the conference of the Health Physics Society are presented. Topics discussed include:

(1) potential adverse effects that the nuclear power industry may have on the environment; (2) pathways of various radionuclides in the biosphere; (3) other radiological hazards; and (4) environmental problems associated with alternatives fossil fuel production. F.O.S.

N75-17089# Professional Staff Association of the Rancho Los Amigos Hospital, Inc., Downey, Calif.
PHYSIOLOGICAL EFFECTS OF AIR POLLUTANTS IN HUMANS SUBJECTED TO SECONDARY STRESS Final Report, 1 Jan. 1973 - 30 Jun. 1974
Jack D. Hackney Sep. 1974 178 p refs
(Contract ARB-2-372)
(PB-236151/7; ARB-R-2-372-74-25) Avail: NTIS HC $7.00 CSCL 06P

Adult male volunteers were exposed to purified air or to ozone, alone or in combination with nitrogen dioxide and carbon monoxide, in an investigation of physiological effects of photochemical air pollution. Exposure conditions simulated those of a smoggy Southern California summer, including the secondary stresses of heat, exercise and repeated exposure. Pulmonary function, blood biochemistry, psychomotor performance capability, and symptoms experienced by the subjects were evaluated. Ozone exposures similar to those expected during pollution episodes produced significant decrement in pulmonary function, symptoms sufficient to restrict normal activity, and oxidative changes in erythrocytes. Psychomotor tracking ability and measures of attention were adversely affected by heat, but not by ozone exposure. Subjects with a history of cough, chest discomfort, or wheezing associated with allergy or exposure to air pollution, were more reactive than subjects without such a history. Author

N75-17090# Naval Postgraduate School, Monterey, Calif.
A STATISTICAL EVALUATION OF THE THEORY OF BIORHYTHMS M.S. Thesis
Louis John Giannotti Sep. 1974 75 p refs
(AD-787377) Avail: NTIS CSCL 06/16

The thesis presents an interpretation of the theory of biorhythms and develops a combined statistical model for a statistical calidation of the theory. The model is then used to investigate a set of intellectual data and a set of accident data. The intellectual data is based upon 112 academic grades taken from four postgraduate school students over a 14 month period. The accident data, taken from insurance abstracts, consists of 66 accidents which occurred at a pulp plant in British Columbia, Canada. Author (GRA)

N75-17213* Telecare Inc., Houston, Tex.
THE PROCESSING AND TRANSMISSION OF EEG DATA
A. E. Schulze *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 267-272 refs (For availability see N75-17188 08-80)
CSCL 06E

N75-17214* Southwest Research Inst., San Antonio, Tex.
MEDICAL BENEFITS FROM THE NASA BIOMEDICAL APPLICATIONS PROGRAM
John L. Sigmon *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 273-280 (For availability see N75-17188 08-80)
CSCL 06E

N75-17215* Texas Univ., Houston.
HYPOBARIC CHAMBER FOR THE STUDY OF ORAL HEALTH PROBLEMS IN A SIMULATED SPACECRAFT ENVIRONMENT
Lee R. Brown *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 281-286 (For availability see N75-17188 08-80)
CSCL 06B

N75-17216* Baylor Univ., Houston, Tex.
IMAGE PROCESSING OF ANGIOGRAMS: A PILOT STUDY
L. E. Larsen, R. A. Evans, and J. O. Roehm, Jr. *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 287-291 refs (For availability see N75-17188 08-80)
CSCL 06B

N75-17217* Texas Heart Inst., Houston.
INTERDISCIPLINARY STUDIES ON THE DEVELOPMENT OF NUCLEAR-FUELED CIRCULATORY SUPPORT SYSTEMS: COLLABORATION OF INDUSTRY AND ACADEME
John C. Norman *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 293-319 refs (For availability see N75-17188 08-80)
CSCL 06B

N75-17218* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE TECHNOLOGY IN REMOTE HEALTH CARE
Norman Belasco *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 321-333 (For availability see N75-17188 08-80)
CSCL 06E

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-17091 British Library Lending Div., Boston Spa (England).
THE EFFECT OF DISTURBING ACOUSTIC SOURCES ON SOME PSYCHOLOGICAL FUNCTIONS
I. Franaszczuk Mar. 1974 14 p refs Transl. into ENGLISH from Prace Central. Inst. Ochrony Pracy (Warsaw), v. 21, no. 71, 1971 p 335-342
(RTS-8831) Avail: British Library Lending Div., Boston Spa, Engl.: £1.30; 4 BLL photocopy coupons

The results obtained from experimental tests on the effect of noise of various physical kinds on the psychomotor capabilities of man, as measured under laboratory conditions, It is found that (1) A band of white noise of mean frequency 4000 Hz prolongs the time of the simple reaction; (2) this noise impairs perceptive capability; (3) in certain conditions a noise of level not over 85 db and not containing predominant high frequency tones can be activating factors; and (4) in disturbing noise man compensates his lowered efficiency by additional effort.

N75-17092*# Columbia Univ., New York. Noise Research Unit.
ANNOYANCE AND ACCEPTABILITY JUDGEMENTS OF NOISE PRODUCED BY THREE TYPES OF AIRCRAFT BY RESIDENTS LIVING NEAR JFK AIRPORT
Paul N. Borsky 1 Dec. 1974 111 p refs
(Grant NGL-33-008-118)
Avail: NTIS HC $5.25 CSCL 05E

A random sample of selected communities near JFK Airport were interviewed. Subsamples, with differing feelings of fear of aircraft crashes and different locations of residence were invited to participate in a laboratory experiment. The subjects were exposed to tape recordings of simulated flyovers of aircraft in approach and departure operations at nominal distances from the airport. The subjects judged the extent of noise annoyance and acceptability of the aircraft noises. Results indicate that level of noise is most significant in affecting annoyance judgements. Subjects with feelings of high fear report significantly more annoyance and less acceptability of aircraft noise than subjects with feelings of low fear. Author

N75-17093*# Kanner (Leo) Associates, Redwood City, Calif.
MOTION PERCEPTION. REPORT 1: PERCEPTION OF MINUTE MOVEMENTS
A. Basler Washington NASA Feb. 1975 25 p refs Transl. into ENGLISH FROM Pfluegers Arch. Gesam. Physiol. (West Germany), v. 115, 1906 p 582-601
(Contract NASw-2481)
(NASA-TT-F-16186) Avail: NTIS HC $3.25 CSCL 05E

The object of this study was to determine how small a displacement may be perceived as movement. Subjects observed minute displacements of a lever, mounted on a metal sheet and visible through a slit in a covering sheet. It was found that in the macula lutea a movement through a visual angle of 20 sec is perceived, even though two points less than 50 sec apart are

not distinguished as separate. Subjects considerably overestimated minute movements, especially when the moving object was close to the eye. Motion perception decreases toward the periphery, most rapidly as one moves upward from the macula lutea. Speed of motion and total lighting also had an effect. Author

N75-17094# Civil Aeromedical Inst., Oklahoma City, Okla.
PERSONALITY AND PHYSIOLOGICAL CORRELATES OF PERFORMANCE DECREMENT ON A MONOTONOUS TASK REQUIRING SUSTAINED ATTENTION
Richard I. Thackray, Karen N. Jones, and Robert M. Touchstone Dec. 1973 18 p refs
(AD-777825; FAA-AM-73-14) Avail: NTIS HC $3.00

The reductions in task load resulting from the increasing automation of air traffic control may actually increase the requirement for controllers to maintain high levels of sustained attention in order to detect infrequent system malfunctions. A previous study indicated that individuals scoring high on a distractibility scale found it difficult to maintain sustained attention on a monotonous, but perceptually demanding, task. The present study used the same serial reaction task to study other possible personality, as well as physiological, correlates of individual differences in performance decrement under low task-load conditions. Sixty subjects performed the task continuously for 40 minutes. Extraverted subjects showed increasing lapses of attention, while introverted subjects failed to show any evidence of a decline in attention. Of the two extraversion components (impulsivity and sociability), impulsivity was the component responsible for the obtained decrement. Heart-rate variability showed a significant relationship with performance decrement while mean heart rate did not. Author

N75-17095# Civil Aeromedical Inst., Oklahoma City, Okla.
PHYSIOLOGICAL RESPONSES
C. E. Melton, J. M. McKenzie, B. David Polis (NADC), Marlene Hoffmann, and J. T. Saldivar, Jr. Dec. 1973 24 p refs
(AD-777838; FAA-AM-73-21) Avail: NTIS HC $3.00

Biochemical and physiological indices of stress showed that the level of stress of 16 air traffic controllers at the Houston Intercontinental Airport Tower was indistinguishable from that of control populations. While the level of stress was lower than that among O'Hare Tower controllers, both groups showed about the same degree of adaptation. Day work (heavy traffic load) at Houston was characterized by elevated levels of all stress indicators as compared with the mid-shift (light traffic); epinephrine excretion increased significantly during the last half of the mid-shift as compared with the first half. Urinary stress indicators (17-ketogenic steroids, epinephrine, norepinephrine) were all significantly elevated during day sleep as compared with night sleep, indicating less effective rest during day sleep. The data support the practice of controllers moving from high-stress, high-density locations to lower-density facilities when either air safety or the controller's well-being is in question. Author

N75-17096# Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.
HUMAN ENGINEERING STUDIES OF HIGH SPEED PEDESTRIAN CONVEYORS Final Report
A. C. Browning London Aeron. Res. Council 1974 56 p refs Supersedes RAE-TR-71104; ARC-34179
(ARC-CP-1278; RAE-TR-71104; ARC-34179) Avail: NTIS HC $4.25; HSMO 95p; PHI $3.90

The tolerance of pedestrians to motion of the accelerator or decelerator, their ability to transfer between conveyors, and safety in general were experimented on 1000 subjects. A motion simulator was devised in the form of a wooden trolley towed by a battery electric tractor. ESRO

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-17097*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
DESICCANT HUMIDITY CONTROL SYSTEM Final Report, 21 Jun. 1971 - 21 Jun. 1972
Peter J. Lunde and Frank L. Kester Jun. 1975 350 p
(Contract NAS9-11971)
(NASA-CR-115568; SVHSER-6040) Avail: NTIS HC $9.50 CSCL 06K

A water vapor and carbon dioxide sorbent material (designated HS-C) was developed for potential application to the space shuttle and tested at full scale. Capacities of two percent for carbon dioxide and four percent for water vapor were achieved using space shuttle cabin adsorption conditions and a space vacuum for desorption. Performance testing shows that water vapor can be controlled by varying the air process flow, while maintaining the ability to remove carbon dioxide. A 2000 hour life test was successfully completed, as were tests for sensitivity to cleaning solvent vapors, vibration resistance, and flammability. A system design for the space shuttle shows a 200 pound weight advantage over competitive systems and an even larger advantage for longer missions. Author

N75-17098*# Beckman Instruments, Inc., Anaheim, Calif. Advanced Technology Operations.
FLUID INFUSION SYSTEM Final Report
J. C. Hammond Jan. 1975 14 p
(Contract NAS9-14080)
(NASA-CR-141579; FR-1185-101) Avail: NTIS HC $3.25 CSCL 06B

Development of a fluid infusion system was undertaken in response to a need for an intravenous infusion device operable under conditions of zero-g. The initial design approach, pursued in the construction of the first breadboard instrument, was to regulate the pressure of the motive gas to produce a similar regulated pressure in the infusion liquid. This scheme was not workable because of the varying bag contact area, and a major design iteration was made. A floating sensor plate in the center of the bag pressure plate was made to operate a pressure regulator built into the bellows assembly, effectively making liquid pressure the directly controlled variable. Other design changes were made as experience was gained with the breadboard. Extensive performance tests were conducted on both the breadboard and the prototype device; accurately regulated flows from 6 ml/min to 100 ml/min were achieved. All system functions were shown to operate satisfactorily. Author

N75-17099*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TELEOPERATOR/ROBOT TECHNOLOGY CAN HELP SOLVE BIOMEDICAL PROBLEMS
E. Heer and A. Bejczy 1 Jan. 1975 20 p refs
(Contract NAS7-100)
(NASA-CR-142089; JPL-TM-33-721) Avail: NTIS HC $3.25 CSCL 05H

Teleoperator and robot technology appears to offer the possibility to apply these techniques to the benefit for the severely handicapped giving them greater self reliance and independence. Major problem areas in the development of prostheses and remotely controlled devices for the handicapped are briefly discussed, and the parallelism with problems in the development of teleoperator/robots identified. A brief description of specific ongoing and projected developments in the area of remotely controlled devices (wheelchairs and manipulators) is provided. Author

N75-17100*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MAN-MACHINE INTERACTIVE IMAGING AND DATA PROCESSING USING HIGH-SPEED DIGITAL MASS STORAGE
H. Alsberg and R. Nathan 15 Jan. 1975 16 p refs
(Contract NAS7-100)
(NASA-CR-142088; JPL-TM-33-717) Avail: NTIS HC $3.25 CSCL 05H

The role of vision in teleoperation has been recognized as an important element in the man-machine control loop. In most applications of remote manipulation, direct vision cannot be used. To overcome this handicap, the human operator's control capabilities are augmented by a television system. This medium

provides a practical and useful link between workspace and the control station from which the operator perform his tasks. Human performance deteriorates when the images are degraded as a result of instrumental and transmission limitations. Image enhancement is used to bring out selected qualities in a picture to increase the perception of the observer. A general purpose digital computer, an extensive special purpose software system is used to perform an almost unlimited repertoire of processing operations. Author

N75-17101*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Biotechnology and Space Sciences Dept.
COST ANALYSIS OF LIFE SCIENCES EXPERIMENTS AND SUBSYSTEMS
M. M. Yakut Feb. 1975 193 p
(Contract NAS8-28377)
(NASA-CR-120604; MDC-G5713) Avail: NTIS HC $7.00 CSCL 06G

Cost estimates for experiments and subsystems flown in the Spacelab were established. Ten experiments were cost analyzed. Estimated cost varied from $650,000 for the hardware development of the SPE water electrolysis experiment to $78,500,000 for the development and operation of a representative life sciences laboratory progra u. The cost of subsystems for thermal, atmospheric and trace contaminants control of the Spacelab internal atmosphere was also estimated. Subsystem cost estimates were based on the utilization of existing components developed in previous space programs whenever necessary. Author

N75-17102*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MINIATURE MUSCLE DISPLACEMENT TRANSDUCER Patent Application
Cyril Feldstein (JPL), Jules V. Osher (JPL), Gilbert W. Lewis (JPL), Robert H. Silver (JPL), and Edward N. Duran, inventors (to NASA) (JPL) Filed 27 Dec. 1974 13 p
(Contract NAS7-100)
(NASA-Case-NPO-13519-1; US-Patent-Appl-SN-536761) Avail: NTIS HC $3.25 CSCL 06B

A miniature transducer, is described for use in sensing muscle displacement. Essentially this invention consists of a curved beam of high elastic compliance. The beam is connected at its ends to two prongs, which have sharpened tips insertable into a muscle. A very sensitive strain gauge is bonded to the beam at the point of greatest curvature. As the muscle contracts or expands, the spacing between the prongs changes, thereby changing the beam curvature which produces changes in the output signal across output lines of the strain gauge. NASA

N75-17103# Joint Publications Research Service, Arlington, Va.
CERTAIN PECULIARITIES OF MODELING GROUP ACTIVITIES OF OPERATORS
B. A. Smirnov 3 Jan. 1975 12 p refs Transl. into ENGLISH from Probl. Bioniki (Kharkov), no. 7, 1971 p 75-80
(JPRS-63789) Avail: NTIS HC $8.50

The positive and negative effects of operator activities are investigated monitoring human performance. Operators of modern control systems are described. Models are presented, showing probabilities of error-free work of operators. M.C.F.

N75-17104*# URS/Matrix Co., Houston, Tex. Life and Environmental Sciences Div.
DEVELOPMENT OF AN EVA SYSTEMS COST MODEL. VOLUME 2: SHUTTLE ORBITER CREW AND EQUIPMENT TRANSLATION CONCEPTS AND EVA WORKSTATION CONCEPT DEVELOPMENT AND INTEGRATION Final Report
Jan. 1975 103 p refs
(Contract NAS9-13790)
(NASA-CR-141635) Avail: NTIS HC $5.25 CSCL 06K

EVA crewman/equipment translational concepts are developed for a shuttle orbiter payload application. Also considered are EVA workstation systems to meet orbiter and payload requirements for integration of workstations into candidate orbiter payload worksites. Author

N75-17105*# URS/Matrix Co., Houston, Tex. Life and Environmental Sciences Div.
DEVELOPMENT OF AN EVA SYSTEMS COST MODEL. VOLUME 3: EVA SYSTEMS COST MODEL Final Report
Jan. 1975 86 p refs
(Contract NAS9-13790)
(NASA-CR-141636) Avail: NTIS HC $4.75 CSCL 06K

The EVA systems cost model presented is based on proposed EVA equipment for the space shuttle program. General information on EVA crewman requirements in a weightless environment and an EVA capabilities overview are provided. Author

N75-17106*# URS/Matrix Co., Houston, Tex. Life and Environmental Sciences Div.
MANNED MANEUVERING UNIT MISSION DEFINITION STUDY. VOLUME 1: MMU APPLICATIONS ANALYSIS AND PERFORMANCE REQUIREMENTS Final Report
Jan. 1975 80 p refs 3 Vol.
(Contract NAS9-13790)
(NASA-CR-141631) Avail: NTIS HC $4.75 CSCL 06K

Applications of Manned Maneuvering Units (MMU'S) to the space shuttle program are identified and described. The applications analyses included studies of the shuttle orbiter, orbiter subsystems, and both Sortie and Automated Payloads. Based on practicable MMU applications, general performance and control requirements for shuttle supporting maneuvering units are defined and compared to units evaluated on Skylab. The results of the MMU applications analyses and the general MMU performance and control requirements are presented. To describe a versatile utility-type maneuvering unit, conceptual designs of MMU support subsystems and ancillary equipment were prepared. Concepts for attaching and securing the MMU crewman to various vehicles, structure configurations, and resuce systems were developed. Concepts for ancillary provisions are reported. Author

N75-17107*# URS/Matrix Co., Houston, Tex. Life and Environmental Sciences Div.
MANNED MANEUVERING UNIT MISSION DEFINITION STUDY. VOLUME 2: APPENDICES TO THE MMU APPLICATIONS ANALYSIS Final Report
Jan. 1975 328 p refs 3 Vol.
(Contract NAS9-13790)
(NASA-CR-141632) Avail: NTIS HC $9.50 CSCL 06K

Information used in identifying representative Manned Maneuvering Unit (MMU) from the many Automated and Sortie Payloads and orbiter subsystems is presented. Representative missions were selected to represent typical MMU applications across all payloads and orbiter subsystems. Data analysis sheets are provided with other applicable information. Calculations used in defining MMU general performance and control requirements to satisfy eleven space missions are included. Author

N75-17108*# URS/Matrix Co., Houston, Tex. Life and Environmental Sciences Div.
MANNED MANEUVERING UNIT MISSION DEFINITION STUDY. VOLUME 3: MMU ANCILLARY SUPPORT EQUIPMENT AND ATTACHMENT CONCEPTS Final Report
Jan. 1975 129 p refs 3 Vol.
(Contract NAS9-13790)
(NASA-CR-141633) Avail: NTIS HC $5.75 CSCL 06K

An analysis of Manned Maneuvering Units (MMU) ancillary support equipment and attachment concepts is presented. The major objectives of the study are defined as: (1) identifying MMU applications which would supplement space shuttle safety and effectiveness, (2) to define general MMU performance and control requirements to satisfy candidate shuttle applications, (3) to develop concepts for attaching MMUs to various worksites and equipment, and (4) to identify requirements and develop concepts for MMU ancillary equipment. Author

N75-17109*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
ICE PACK HEAT SINK SUBSYSTEM, PHASE 2 Final Report
George J. Roebelen, Jr. and Jordan D. Kellner Jan. 1975 210 p refs

(Contract NAS2-7011)
(NASA-CR-137611; SVHSER-6525) Avail: NTIS HC $7.25 CSCL 06K

The report describes the design, development, fabrication, and test at one gravity of a prototype ice pack heat sink subsystem to be used eventually for astronaut cooling during manned space missions; the investigation of thermal storage material with the objective of uncovering materials with heats of fusion and/or solution in the range of 300 Btu/lb (700 kilojoules/kilogram); and the planned procedure for implementing an ice pack heat sink subsystem flight experiment. In normal use, excess heat in the liquid cooling garment (LCG) coolant is transferred to a reusable/regenerable ice pack heat sink. For emergency operation, or for extension of extravehicular activity mission time after all the ice has melted, water from the ice pack is boiled to vacuum, thereby continuing to remove heat from the LCG coolant. This subsystem incorporates a quick disconnect thermal interface between the ice pack heat sink and the subsystem heat exchanger. Author

N75-17110# Physics International Co., San Leandro, Calif.
DEVELOPMENT OF AN IMPLANTABLE PIEZOELECTRIC DRIVING SYSTEM FOR A CIRCULATORY ASSIST DEVICE Final Report, 31 Oct. 1970 - 1 May 1971
Parker Smiley 1 May 1971 84 p refs
(Contract PHS-69-2253)
(PB-236446/1; PIFR-169; NIH/NHLI-69-2253-2) Avail: NTIS HC $4.75 CSCL 06B

A bench-model, piezoelectric-driver system for a circulatory assist device was designed, built, and tested. This system consists of an electronic pulser, high-pressure piezoelectric pump, a hydraulic converter and a circulatory assist device. The piezoelectric pump completes one stroke for each beat of a natural heart. The driver system, coupled to an IECO Mark VII blood pump, delivers 5 to 11 liters per minute at freq rencies of 60 to 150 pulses per minute, while requiring 12 to 28 watts mean power to the pulser. A compact, implantable model of this system was designed so that the pulser and piezoelectric pump would fit into a l-liter package. GRA

N75-17222* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE TECHNOLOGY APPLICATION PROCESS AS APPLIED TO A FIREFIGHTER'S BREATHING SYSTEM
Pat B. McLaughlan *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 391-402 (For availability see N75-17188 08-80)
CSCL 06Q

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N75-17111*# Kanner (Leo) Associates, Redwood City, Calif.
INHABITED SPACE, PART 1
B. P. Konstantinov, ed. and V. D. Pekelis, ed. Washington NASA Feb. 1975 270 p refs Transl. into ENGLISH of the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 214 p
(Contract NASw-2481)
(NASA-TT-F-819) Avail: NTIS HC $8.50 CSCL 06C

Preliminary results are presented of work on prebiology, exobiology, the possibility of life on other planets, cosmic influences on animal and plant life on earth, planetary chemistry, exobiology, and the problem of defining life on other than a carbon basis. The authors are mostly Soviet, with several Western and European authorities included, as well as some American experts. Author

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N75-17112 Polish Academy of Sciences, Warsaw.
MEASUREMENT AND ANALYSIS OF NOISE IN THE PERIPHERAL ATTACHMENTS OF ELECTRONIC DIGITAL CALCULATORS [POMIARY I ANALIZA HALASU URZADEN PERYFERYJNYCH ELEKTRONICZNYCH MASZYN CYFROWYCH]
J. Motylewski, T. Zmierczak, and T. Wasala 10 Mar. 1973 40 p In POLISH
(Rept-5/1973) Avail: Issuing Activity

Information was collected about the general level and structure of noise emitted through certain types of peripheral electronic digital calculator attachments such as a tape reader, rapid tape reader, and tape perforator. Spectrum analysis was used for this investigation. Noise levels at ultra-audible frequencies are presented along with graphs of the results. Transl. by M.J.S.

N75-17113# Los Alamos Scientific Lab., N.Mex.
INTERACTIVE GRAPHICS SYSTEM FOR MECHANICAL DRAFTING AND DESIGN
J. N. Beatty 1974 7 p refs Presented at CUBE Symp., Livermore, Calif., 23 Oct. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1578; Conf-741001-8) Avail: NTIS HC $3.25

Mechanical drafting and design using interactive graphics can be made effective by providing the designer with his everyday tools and terminology coupled with the speed of a computer system. A graphics system consisting of current state-of-the-art hardware, and software written in a high level language provides the engineer an effective way to make expansions and changes as use dictates. Author (NSA)

N75-17114# Mason and Hanger-Silas Mason Co., Inc., Burlington, Iowa.
COMPUTER MICRODENSITOMETER (DRUM SCANNER) SYSTEM, JANUARY - MARCH 1974
C. L. Harris and L. W. Black 1974 3 p Sponsored by AEC
(Contract DA-11-113-AMC-487(A))
(MHSMP-74-9M) Avail: NTIS HC $3.25

The drum scanner-computer system was specifically obtained to look for flaws in HE loaded parts via radiographic analysis. The system components were interfaced in October 1973. Since that time development of software to accomplish the flaw detection and analysis task has been a continuing job. Programs to allow the computer to control the microdensitometer were working successfully by the middle of December 1973. Author (NSA)

N75-17115# Montedel-Montecatini Edison Elettronica S.p.A., Milan (Italy). Laben Space Instrumentation Labs.
STUDY AND DEVELOPMENT OF A HIGH SPEED A/D CONVERTER FOR SPACE APPLICATION Final Report
Nov. 1973 215 p
(Contract ESTEC-1678/72-HP)
(TN-TL-1078; ESRO-CR(P)-565) Avail: NTIS HC $7.25

A high speed analog to digital converter in modular form, making extended use of parallel operation in both threshold

comparison and digital to analog conversion, was designed and implemented for space applications. The modular form is intended to give maximum possibilities for further development. The results of tests on a breadboard model are given. ESRO

N75-16937 Joint Publications Research Service, Arlington, Va.
BELORUSSIAN EXPERIMENT IN CENTRALIZED AUTOMATED PROCESSING OF ATMOSPHERIC SOUNDING DATA
G. P. Trifonov, G. A. Plotnikov, and K. I. Goltsova *In its* Meteorol. and Hydrol., no. 10, 1974 (JPRS-63748) 26 Dec. 1974 p 134-144 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 10, 1974 p 105-110 (For availability see N75-16922 08-42)

N75-17289 Joint Publications Research Service, Arlington, Va.
VIDEOTON COMPUTER TECHNOLOGY FACTORY PRODUCTION
Mihaly Papai *In its* Transl. on Eastern Europe (JPRS-63772) 31 Dec. 1974 p 8-22 Transl. into ENGLISH from Finommechanika-Mikrotechnika (Hungary), v. 13, 1974 p 289-294 (For availability see N75-17287 08-99)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-17116 British Library Lending Div., Boston Spa (England).
PREPROCESSING OF HAND-WRITTEN GRID-PLACED CHARACTERS FOR INPUT INTO COMPUTERS
Alwin Gudesen 5 Aug. 1974 22 p refs Transl. into ENGLISH from the German report
(BLL-Trans-3142-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The results are presented of various methods and techniques for preprocessing image patterns on digital computers. The problem in classifying hand written numerals and letters is examined and the effects of centering and positioning the patterns on the grid, structure of the character, and geometry of the pattern are discussed as preprocessing procedures for improving the grid input to computers. F.O.S.

N75-17117 British Library Lending Div., Boston Spa (England).
RAPID ALGORITHM FOR DIGITAL COMPUTER PATTERN TRANSFORMATION
H. Bleichrodt [1974] 8 p refs Transl. into ENGLISH from Mitt. Inst. Inform. Ver. Tech. Biol. (West Ger.), 1972/73 p 16-18
(BLL-Trans-3144-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

In processing quantized pattern problems of grid size, transformation and inherent redundancy arise. An algorithm is described which makes it possible to solve these problems. Further, ways in which quantization errors occurring during transformation can be influenced in a controlled manner and in which redundancy can be reduced are explained. Author

N75-17118*# Aerophysics Research Corp., Houston Tex.
THE ENGINEERING DESIGN INTEGRATION (EDIN) SYSTEM
C. R. Glatt, G. N. Hirsch, G. E. Alford, W. N. Colquitt, and S. J. Reiners Dec. 1974 239 p refs
(Contract NAS9-13584)
(NASA-CR-141598; JTN-11) Avail: NTIS HC $7.50 CSCL 09B

A digital computer program complex for the evaluation of aerospace vehicle preliminary designs is described. The system consists of a Univac 1100 series computer and peripherals using the Exec 8 operating system, a set of demand access terminals of the alphanumeric and graphics types, and a library of independent computer programs. Modification of the partial run streams, data base maintenance and construction, and control of program sequencing are provided by a data manipulation program called the DLG processor. The executive control of library program execution is performed by the Univac Exec 8 operating system through a user established run stream. A combination of demand and batch operations is employed in the evaluation of preliminary designs. Applications accomplished with the EDIN system are described. Author

N75-17119*# Aerophysics Research Corp., Houston Tex.
PLOTTER: AN INDEPENDENT COMPUTER PROGRAM FOR THE GENERATION OF GRAPHICAL DISPLAYS Technical Report, Jun. 1973 - Dec. 1974
C. R. Glatt and G. N. Hirsch Nov. 1974 74 p
(Contract NAS9-13584)
(NASA-CR-141593; JTN-07) Avail: NTIS HC $4.25 CSCL 09B

A computer program is described for generating graphical information from input data or auxiliary analysis programs on a variety of graphical devices. Options are presented for tabulating the data in columnar format and for plotting auxiliary text in the vicinity of the plotted information. Display device selection is accomplished by interfacing the basic computer code through routines which convert the internally generated plot vectors to hardware commands for the display device. The plotting techniques employed in the computer program are discussed. User's instructions are presented with examples which illustrate the use of the program in generating plotted information from various sources and presenting the information in alternate plot formats. Technical discussion of the computer code is presented giving the physical characteristics, computer loading instructions and descriptions of the subroutines. Author

N75-17120*# Aerophysics Research Corp., Houston Tex.
GEOMETRY TECHNOLOGY MODULE (GTM). VOLUME 1: ENGINEERING DESCRIPTION AND UTILIZATION MANUAL Final Report
S. J. Reiners, G. N. Hirsch, G. E. Alford, and C. R. Glatt Dec. 1974 113 p refs 2 Vol.
(Contract NAS9-13584)
(NASA-CR-141594; JTN-09-Vol-1) Avail: NTIS HC $5.25 CSCL 09B

The geometry technology module (GTM) is described as a system of computerized elements residing in the engineering design integration system library developed for the generation, manipulation, display, computation of mass properties, and data base management of panelled geometry. The GTM is composed of computer programs and associated data for performing configuration analysis on geometric shapes. The program can be operated in batch or demand mode and is designed for interactive use. Author

N75-17121*# Aerophysics Research Corp., Houston Tex.
GEOMETRY TECHNOLOGY MODULE (GTM). VOLUME 2: PROGRAMMERS' MANUAL Final Report, Jun. 1973 - Dec. 1974
S. J. Reiners, G. N. Hirsch, W. N. Colquitt, G. E. Alford, and C. R. Glatt Dec. 1974 123 p ref 2 Vol.
(Contract NAS9-13584)
(NASA-CR-141595; JTN-09-Vol-2) Avail: NTIS HC $5.25 CSCL 09B

For abstract, see N75-17120.

N75-17122*# Aerophysics Research Corp., Houston Tex.
THE DLG PROCESSOR: A DATA MANAGEMENT EXECUTIVE FOR THE ENGINEERING DESIGN INTEGRATION (EDIN) SYSTEM. VOLUME 1: ENGINEERING DESCRIPTION AND UTILIZATION MANUAL Final Report, Jun. 1973 - Dec. 1974
C. R. Glatt and W. N. Colquitt Dec. 1974 36 p ref
(Contract NAS9-13584)
(NASA-CR-141596; JTN-10-Vol-1) HC $3.75 CSCL 09B

The DLG processor is a Univac 1100 series computer program designed to read, modify, manipulate, and replace symbolic images. DLG is controlled by a set of user supplied directives and operates from a data base of stratified information which can be merged with the symbolic images. Data bases can be constructed and maintained in the mass storage media using the DLG directive language. Author

N75-17123*# Aerophysics Research Corp., Houston Tex.
THE DLG PROCESSOR: A DATA MANAGEMENT EXECUTIVE FOR THE ENGINEERING DESIGN INTEGRATION (EDIN) SYSTEM. VOLUME 2: PROGRAMMERS' MANUAL Final Report, Jun. 1973 - Dec. 1974
C. R. Glatt and W. N. Colquitt Dec. 1974 165 p
(Contract NAS9-13584)
(NASA-CR-141597; JTN-10-Vol-2) Avail: NTIS HC$6.25 CSCL 09B

For abstract, see N75-17122.

N75-17124*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DIGITAL COMPUTER PROGRAMS FOR GENERATING OBLIQUE ORTHOGRAPHIC PROJECTIONS AND CONTOUR PLOTS
Gary L. Giles Washington Jan. 1975 140 p refs
(NASA-TN-D-7797; L-9766) Avail: NTIS HC $5.75 CSCL 09B

User and programer documentation is presented for two programs for automatic plotting of digital data. One of the programs generates oblique orthographic projections of three-dimensional numerical models and the other program generates contour plots of data distributed in an arbitrary planar region. A general description of the computational algorithms, user instructions, and complete listings of the programs is given. Several plots are included to illustrate various program options, and a single example is described to facilitate learning the use of the programs. Author

N75-17125*# Sperry Rand Corp., Huntsville, Ala.
A STRUCTURED MICROPROGRAM SET FOR THE SUMC COMPUTER TO EMULATE THE IBM SYSTEM/360, MODEL 50 M.S. Thesis - Ala. Univ.
Cesar R. Gimenez 1975 163 p refs
(Contract NAS8-21812)
(NASA-CR-120582) Avail: NTIS HC $6.25 CSCL 09B

Similarities between regular and structured microprogramming were examined. An explanation of machine branching architecture (particularly in the SUMC computer), required for ease of structured microprogram implementation is presented. Implementation of a structured microprogram set in the SUMC to emulate the IBM System/360 is described and a comparison is made between the structured set with a nonstructured set previously written for the SUMC. Author

N75-17126# Aerojet Nuclear Co., Idaho Falls, Idaho.
MOCUS: A COMPUTER PROGRAM TO OBTAIN MINIMAL SETS FROM FAULT TREES
J. B. Fussell, E. B. Henry, and N. H. Marshall Aug. 1974 42 p refs
(Contract AT(10-1)-1375)
(ANCR-1156) Avail: NTIS HC $3.75

The user's manual is presented for MOCUS, a computer program for obtaining minimal cut sets and minimal sets from fault trees. The major algorithm used in MOCUS is presented. The input and output of the program are described.
Author (NSA)

N75-17127# Los Alamos Scientific Lab., N.Mex.
GENERAL PURPOSE PROGRAM FOR MANIPULATING AND ANALYZING TABULAR DATA
Robert V. Fultyn 1974 9 p Presented at the CUBE Symp., Livermore, Calif., 23-25 Oct. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1582; Conf-741001-7) Avail: NTIS HC $3.25

ATLAS is a general purpose program for manipulating and analyzing tabular data. Numbers of variables, input and output formats, types and order of manipulative operations are all chosen at execution time. Various sorting, selecting, ordering, and statistical operations are also selectable as are graphical outputs. If necessary, the code can be relatively easily modified to include manipulative operations that are peculiar to a particular data set. Standard manipulations include those found on better scientific calculations (i.e., add, substract, multiply, divide, log, exponent, trig functions, etc.). Any number of manipulations can be performed in any order. Author (NSA)

N75-17128# Knolls Atomic Power Lab., Schenectady, N.Y.
DATATRAN 2 IMPLEMENTATION
H. J. Kopp, W. E. Schilling, D. S. Selengut, R. G. Stieglitz, K. L. Hanawalt, and J. J. Urbaniak Oct. 1974 198 p refs
(Contract W-31-109-eng-52)
(KAPL-M-7386) Avail: NTIS HC $7.00

Datatran 2 is a non-interactive data base management language that is used as the environment for a modular computer program network. This manual describes the programming used to implement the language on CDC-6600 and CDC-7600 equipment. It is intended to serve as a maintenance document at the Bettis Atomic Power Laboratory and KAPL as well as a guide for installation on other computers. More than 80 percent of the programming is in FORTRAN IV. Author (NSA)

N75-17129# Sandia Labs., Albuquerque, N.Mex.
DEVELOPMENT OF THREEDY: A THREE DIMENSIONAL WAVECODE USING OPERATOR SPLITTING AND WAVEFITTING ON A MOVABLE MESH
D. L. Hicks, H. S. Lauson, and M. M. Madsen 1974 4 p refs Presented at the CUBE Symp., Livermore, Calif. Sponsored by AEC
(SAND-74-5537; Conf-741001-4) Avail: NTIS HC $3.25

THREEDY is a three dimensional wavecode that employs the techniques of operator splitting, wavefitting, movable meshes, controlled entropy production, and a conservative, implicit-optional-explicit, discrete scheme. Operator splitting splits the three dimensional solution operator into one dimensional operators thereby simplifying the structure of the code. Wavefitting improves the accuracy around wavefronts. A movable mesh alleviates the problem of severe distortion suffered in purely material coordinate wavecodes on hypervelocity impact calculations. However, the basic computation is done in the material Lagrangean frame to keep track of material boundaries and material histories necessary to properly evaluate certain material laws. Author (NSA)

N75-17130# Sandia Labs., Albuquerque, N.Mex.
INSTRUCTIONS FOR USING THE SETS PROGRAM
R. B. Worrell Oct. 1974 25 p refs
(Contract AT(29-1)-789)
(SLA-73-0908A) Avail: NTIS HC $3.25

Instructions for using the SETS program are given. The information necessary to obtain access to a permanent file containing various versions of the SETS program is given, as well as SCOPE control card sequences for executing the program on a CDC 6600 under a variety of circumstances. Also, diagnostic messages that can occur during execution are explained and, when appropriate, corrective procedures are suggested.
Author (NSA)

N75-17131# Royal Radar Establishment, Malvern (England).
A SET OF PROGRAMS TO ASSIST IN THE ASSESSMENT OF CORAL 66 COMPILERS
N. J. F. Neve and J. T. Webb May 1974 6 p refs
(RRE-782; BR42183) Avail: NTIS HC $3.25

The development of a set of test programs designed to assist in the assessment of CORAL 66 compilers and the method of validation are described. CORAL 66 is a standard high level language for real time applications. A CORAL 66 machine is a combination of hardware and software comprising a computer, a CORAL 66 compiler, and other supporting software, such as a linking loader, which together enable a source text written in CORAL 66 to be compiled into an object code program and then loaded and run on the machine being assessed. ESRO

N75-17132# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
A COMPARISON OF SIX ALGORITHMS FOR DENSE LINEAR PROGRAMS
E. R. Brocklehurst and K. Dennis Jul. 1974 26 p refs
(NPL-NAC-51) Avail: NTIS HC $3.75

Six algorithms for solving dense linear programs are compared in respect to speed and accuracy. From these comparisons inferences are drawn as to how zero tolerances should be chosen and how accuracy can be improved. Some of the conclusions reached apply also to algorithms for sparse linear programs.
Author (ESRO)

62 COMPUTER SYSTEMS

Includes computer networks.

N75-17133 British Library Lending Div., Boston Spa (England).
PRODUCTION SCHEDULES AND COSTS IN COLD FORMING FROM THE SOLID
P. Noack 29 Oct. 1973 12 p ref Transl. into ENGLISH from Ind. Anz. (ESSEN), v. 95, no. 10, 1973 p 161-164 In GERMAN and ENGLISH
(BLL-NEL-TT-2454-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The practical application of two computer programs for solving production schedule problems is discussed. These programs apply to cold forming manufacturing processes for rotationally symmetrical solid bodies and hollow bodies of a given geometry. G.G.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

N75-17134# Lockheed Missiles and Space Co., Palo Alto, Calif.
OPTOELECTRONIC PATTERN RECOGNITION UNIT
A. A. Aleksandrov, R. I. Polonnikov, and E. I. Trofimov [1975] 5 p refs Transl. into ENGLISH from the book "Opticheskaia i Elektroopticheskaia Obrabotka Informatsii" Moscow, Nauka, 1974 p 66-71
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

An optoelectronic two-dimensional Hadamard spectrum analyzer is discussed along with Hadamard matrices and the role of matrix methods in signal processing. It is shown that lensless multichannel spectrum analyzers can be used extensively because of their compactness and low energy demands. Other topics discussed include Fourier transformation, Walsh function, optical spectrometers, photodetectors, and multiplexing. M.J.S.

N75-17135# Sandia Labs., Albuquerque, N.Mex.
PROGRAMMABLE CALCULATOR MEASUREMENT SYSTEMS
David M. Darsey 1974 5 p Presented at the CUBE Symp., Livermore, Calif., 23 Oct. 1974 Sponsored by AEC
(SAND-74-5156; Conf-741001-5) Avail: NTIS HC $3.25

The programmable calculator can often be used as an intelligent controller for measurement and control systems. Use of a calculator rather than a minicomputer can simplify programing and interface hardware with resulting savings in development and maintenance costs. Advantages, disadvantages, and important trade-offs in considering calculators are presented, with the application of a static load testing laboratory as an example. Calculator-based systems are best applied when high speed and large quantities of input-output are not of primary importance. Many scientific laboratories can benefit from the simplified setup and programing of the new calculators. Author (NSA)

N75-17136# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
POSSIBILITIES AND LIMITS OF SIMULATION BY THE FORRESTER SYSTEMS DYNAMICS STATEMENT AS A METHOD FOR COMPLEX SYSTEMS INVESTIGATIONS EXEMPLIFIED BY A TYPICAL AEROSPACE TRANSPORT SYSTEM [MOEGLICHKEITEN UND GRENZEN DER SIMULATION MIT HILFE DES 'SYSTEM-DYNAMICS' ANSATZES VON FORRESTER ALS METHODE DER UNTERSUCHUNG KOMPLEXER SYSTEME AM BEISPIEL EINES TYPISCHEN TRANSPORTSYSTEMS DER LUFT- UND RAUMFAHRT]
P. Scheller 1974 224 p refs In GERMAN; ENGLISH summary
(IRL-16-1974) Avail: NTIS HC $7.25

The system dynamics method was applied on the simulation of the management structure of the German airline company Deutsche Lufthansa. The desirability of introducing a new type of aircraft (Airbus) into an existing fleet was investigated. Possibilities and limitations of the simulation method in connection with DYNAMO, the problem oriented simulation language used, are discussed. Advantages of the system include great flexibility, good possibility of documentation, possibility of very precise reality representation, and possibility of very easy learning. However, DYNAMO does not allow interval interventions and it does not dispose of enough macros for representing all of the world's (system) discrete events. ESRO

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-17137 Polish Academy of Sciences, Warsaw.
APPLICATION OF A PROJECTIVE OPERATOR METHOD TO AN APPROXIMATE SOLUTION OF THE BOLTZMANN EQUATION [ZASTOSOWANIE METODY OPERATORA RZUTOWEGO DO PRZYBLIZONEGO ROZWIAZANIA ROWNANIA BOLTZMANNA]
W. Fiszdon and E. Wytyk 16 Nov. 1973 25 p refs In POLISH
(Rept-45/1973) Avail: Issuing Activity

A projective operator method for determining transport coefficients of a continuous media model is discussed. It is used for finding the gas state found in the vicinity of equilibrium flow described by the Maxwell distribution. Short duration solutions were investigated along with the influence of second approximation on heat flux and superficial tension.
Transl. by M.J.S.

N75-17138*# Houston Univ., Tex. Dept. of Mathematics.
SOME RESULTS ON THE DIVERGENCE CRITERION USED TO SOLVE THE FEATURE SELECTION PROBLEM
Dennison R. Brown and Matthew J. Omalley Nov. 1974 19 p refs
(Contract NAS9-12777)
(NASA-CR-141624; Rept-40) Avail: NTIS HC $3.25 CSCL 12A

Techniques for solving the feature selection problem are presented. Topics discussed include the reduction of the number of variables in 'best b', and the iterative selection of H sub i.
F.O.S.

N75-17139*# Houston Univ., Tex.
A SIMPLIFIED PACKAGE FOR CALCULATING WITH SPLINES
Philip W. Smith Oct. 1974 31 p refs
(Contract NAS9-12777)
(NASA-CR-141623) Avail: NTIS HC $3.75 CSCL 12A

This package is designed to solve some of the elementary problems of spline interpretation and least squares fit. The subroutines fall into three basic categories. The first category involves computations with a given spline and/or knot sequence; the second category involves routines which calculate the coefficients of splines which perform a certain task (such as interpolation or least squares fit); and the last category is a banded equation solver for specific linear equations. Author

N75-17140# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).
INTEGRABLE CYLINDER FUNCTIONALS FOR AN INTEGRAL OF FEYNMAN-TYPE
D. Bucholz and J. Tarski Jul. 1974 18 p refs
(DESY-74/35) Avail: AEC Depository Libraries HC $4.00

Integrability of cylinder functionals is investigated, for the Feynman-type integral as defined by Ito. Several classes of integrable cylinder functionals are specified. An inductive property of the integral is established. Author (NSA)

N75-17141# Centro Informazioni Studi Esperienze, Milan (Italy).
SOME METHODS FOR NONLINEAR EQUATIONS
E. Spedicato Mar. 1974 37 p
(CISE-N-167) Avail: AEC Depository Libraries HC $5.00

Many mathematical problems lead to the need for solving

systems of nonlinear equations. Methods are discussed that may solve such a problem even in the case of a large sparse Jacobian, and the corresponding computer programs are given. Their performance on some test problems is included. Author (NSA)

N75-17142# Loughborough Univ. of Technology (England). Dept. of Mathematics.
OPTIMAL CONTROL OF NEUTRAL SYSTEMS: A GRADIENT METHOD
M. A. Connor and R. G. Turner Feb. 1974 25 p refs
(MATHS-RES-34) Avail: NTIS HC $3.25

An extension to neutral systems of a general iterative method based on a steepest ascent method for solving optimum programming problems is presented, including terminal constraints. A numerical example is provided, and a simple gradient method useful in special circumstances is described. ESRO

N75-17143# Loughborough Univ. of Technology (England). Dept. of Mathematics.
A GRADIENT METHOD FOR NEUTRAL SYSTEMS WITH TERMINAL FUNCTION CONSTRAINTS
M. A. Connor Apr. 1974 14 p ref
(MATHS-RES-36) Avail: NTIS HC $3.25

A gradient method for general nonlinear neutral systems subject to terminal function constraints is presented. ESRO

N75-17144# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ON COMPOSITE SYSTEMS THAT PRESERVE THE DEGREES OF THEIR SUBSYSTEMS
A. C. Pugh May 1974 15 p refs
(Grant SRC-B/SR/8561)
(MATHS-RES-38) Avail: NTIS HC $3.25

A class of aggregated systems is exhibited, the degree and associated McMillan degree of which are the respective sums of the degrees and McMillan degrees of their subsystems. Some specializations of the main theorem are then made which subsequently yield some new results in the theory of invariants of linear dynamical systems. Author (ESRO)

N75-17145# Loughborough Univ. of Technology (England). Dept. of Mathematics.
THE USE OF CHEBYSHEV SERIES FOR THE EVALUATION OF OSCILLATORY INTEGRALS
Ayse Alaylioglu, G. A. Evans, and J. Hyslop Jul. 1974 17 p refs
(MATHS-RES-41) Avail: NTIS HC $3.25

A method for the numerical integration of a well-behaved function, based on the approximation of f(x) in a series of Chebyshev polynomials, is extended to the consideration of oscillatory integrals. A new efficient algorithm is presented which evaluates the resulting basic integrals by a direct automatic computation which simulates the analytic evaluation. This work is analogous to the automatic generation of quadrature formulae of the Newton-Cotes type for oscillatory integrands. Numerical tests are given for new quadrature rules using subdivision formulae with various step-sizes. Critical comparisons with related earlier work are carried out. Author (ESRO)

N75-17146# Loughborough Univ. of Technology (England). Dept. of Mathematics.
COMMENTS ON TEXTER'S ALGORITHM FOR IMPLEMENTING ZUBOV'S CONSTRUCTION AND A CONJECTURE ON NON-UNIFORM CONVERGENCE OF ZUBOV'S SERIES SOLUTION
D. M. Shields (Lanchester Polytec.) and C. Storey Jul. 1974 6 p refs
(MATHS-RES-43) Avail: NTIS HC $3.25

An algorithm proposed for finding segments of the asymptotic stability domain of a two-dimensional system is not completely new and lacks some justification. A conjecture that the series procedure is non-uniform, if its region of convergence is a subset of the stability domain, is made. Author (ESRO)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-17147# Loughborough Univ. of Technology (England). Dept. of Mathematics.
CRAMER-VON MISES TYPE STATISTICS FOR THE GOODNESS-OF-FIT OF CENSORED DATA: SIMPLE HYPOTHESIS
A. N. Pettitt May 1974 68 p refs
(MATHS-RES-39) Avail: NTIS HC $4.25

Modified Cramer-von Mises type goodness-of-fit statistics based on the sample distribution function when observations are censored were discussed. The asymptotic distributions of the modified statistics, the Cramer-von Mises, the Anderson-Darling, and the Watson are found to be sums of weighted chi-squared random variables where the weights are eigenvalues of integral equations. The small sample distribution of the modified Cramer-von Mises statistics are approximated by three-moment fits. Also, the asymptotic power of the statistics is considered for shifts of location for the normal population, and shifts of scale for the normal and exponential populations. The modified statistics can also be partitioned into components. These components are considered and their asymptotic relative efficiencies given for the same cases as the asymptotic power for the complete statistics above. Author (ESRO)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N75-17148# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
IDENTIFICATION OF LINEAR SYSTEMS WITH TIME DELAY OPERATING IN A CLOSED LOOP IN THE PRESENCE OF NOISE
E. Gabay and S. J. Merhav Aug. 1974 42 p refs
(TAE-223) Avail: NTIS HC $3.75

On-line identification of a linear dynamical system with a time delay operating in a closed loop in the presence of noise is discussed. The method is based on the equation error. The difficulty presented by the time delay is resolved by delayed state variables. The required parameter estimate is obtained directly from closed loop input-output data by means of composite state filters. These prevent the increase of the dimension of the parameter vector which otherwise occurs as a result of the loop closure. A higher order model is used in the equation error. This serves the purpose of identifying the time delay by means of the excess model parameters. The method is illustrated by simulated examples. Author

N75-16920* Scientific Translation Service, Santa Barbara, Calif.
CERTAIN PROBLEMS OF THE AUTOMATED JOINING OF RADAR METEOROLOGICAL INFORMATION
Yu. K. Fedorov and N. A. Fadeeva *In its* Radar Meteorology (NASA-TT-F-14797) Jan. 1975 p 109-113 refs Transl. into ENGLISH from the book "Radiolokatsionnaya Meteorologiya" Leningrad, Gidrometeoizdat Press, 1973 p 144-151 (For availability see N75-16904 08-42)
CSCL 09B

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N75-17149# Loughborough Univ. of Technology (England). Dept. of Mathematics.
THE BEHAVIOUR OF OPTIMAL LYAPUNOV FUNCTIONS
D. N. Shields (Lanchester Polytec.) and C. Storey Jul. 1974 22 p refs

(MATHS-RES-45) Avail: NTIS HC $3.25

The problem of maximizing the size of a region of asymptotic stability over a class of Lyapunov functions in order to estimate the domain of attraction of a continuous or discontinuous system was investigated. Analytic and numerical evidence shows that a subclass of Lyapunov functions may exist with multiple-tangency for the region of asymptotic stability and can cause some serious convergence problems. Several systems are considered with two classes of Lyapunov functions for continuous and one class for relay systems. Author (ESRO)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-17150*# Ohio State Univ., Columbus. ElectroScience Lab.

FINITE DIFFERENCE METHODS FOR TRANSIENT SIGNAL PROPAGATION IN STRATIFIED DISPERSIVE MEDIA

Dong Hoa Lam Jan. 1975 107 p refs

(Grant NsG-3005)

(NASA-CR-142179; ESL-3892-1) Avail: NTIS HC $5.25 CSCL 20N

Explicit difference equations are presented for the solution of a signal of arbitrary waveform propagating in an ohmic dielectric, a cold plasma, a Debye model dielectric, and a Lorentz model dielectric. These difference equations are derived from the governing time-dependent integro-differential equations for the electric fields by a finite difference method. A special difference equation is derived for the grid point at the boundary of two different media. Employing this difference equation transient signal propagation in an inhomogeneous media can be solved provided that the medium is approximated in a step-wise fashion. The solutions are generated simply by marching on in time. It is concluded that while the classical transform methods will remain useful in certain cases, with the development of the finite difference methods described, an extensive class of problems of transient signal propagating in stratified dispersive media can be effectively solved by numerical methods. Author

N75-17151# Northeastern Univ., Boston, Mass.

STAGGERED ICE RULE VERTEX MODEL: THE PFAFFIAN SOLUTION

F. Y. Wu and K. Y. Lin (Natl. Tsing Hua Univ.) Nov. 1974 40 p refs

(Grant NSG DMR72-03213)

(NUB-2243) Avail: NTIS HC $3.75

It is pointed out that the staggered ice-rule model contains a number of outstanding lattice statistical problems including the Ising model in a nonzero magnetic field. The most general Pfaffian solution of this staggered vertex model is studied. In special cases, the solution reduces to that of two recently considered dimer models of phase transitions. It also leads to the exact solution of several vertex models as well as an exact isotherm of a general antiferroelectric model, all in the presence of both direct and staggered fields. Author

N75-17152# Southampton Univ. (England). Inst. of Sound and Vibration Research.

SOUND TRANSMISSION THROUGH DUCTS WITH AND WITHOUT FLOW

George F. Kuhn Feb. 1974 69 p refs

(Contracts SRC-9634/36; SRC-9634/38)

(ISVR-TR-65) Avail: NTIS HC $4.25

Plane wave transmission loss measurements for two pipes, under no flow conditions are presented. The measurements cover the frequency range 315 to 12500 Hz. Some vibrational measurements were taken on the exterior surface of the pipe using strain gauges and accelerometers while the pipe was driven with an internal acoustic plane wave. These vibration measurements suggest that sound transmission occurs via sound radiation by the pipe from its natural bending modes, excited in turn by the first acoustic cross mode. The nature of the excitation is different below and above the acoustic cut-off frequency, being localized below cut-off and distributed along the entire pipe above cut-off. Radiated power measurements from bending modes of the thin pipe compare well with theoretical predictions. An analytical approximation is developed for the single bending mode radiation problem of Yousri and Fahy and extended to the multimode radiation problem below coincidence. Author (ESRO)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N75-17153*# Massachusetts Inst. of Tech., Cambridge.

LABORATORY STUDY OF SONIC BOOMS AND THEIR SCALING LAWS Final Technical Report

Tau-Yi Toong [1974] 10 p

(Grant NGR-22-009-618)

(NASA-CR-142075) Avail: NTIS HC $3.25 CSCL 20A

This program undertook to seek a basic understanding of non-linear effects associated with caustics, through laboratory simulation experiments of sonic booms in a ballistic range and a coordinated theoretical study of scaling laws. Two cases of superbooms or enhanced sonic booms at caustics have been studied. The first case, referred to as acceleration superbooms, is related to the enhanced sonic booms generated during the acceleration maneuvers of supersonic aircrafts. The second case, referred to as refraction superbooms, involves the superbooms that are generated as a result of atmospheric refraction. Important theoretical and experimental results are briefly reported. Author

N75-17154*# United Aircraft Corp., East Hartford, Conn. Research Labs.

INVESTIGATION OF SCRUBBING AND IMPINGEMENT NOISE

Martin R. Fink Washington NASA Feb. 1975 153 p refs

(Contract NAS3-17863)

(NASA-CR-134762) Avail: NTIS HC $6.25 CSCL 20A

Tests were conducted in an acoustic wind tunnel to determine surface pressure spectra and far field noise caused by turbulence impinging on an airfoil and turbulence convected past a sharp trailing edge. Measured effects of flow velocity and turbulence intensity were compared with predictions from several theories. Also, tests were conducted in an anechoic chamber to determine surface pressure spectra and far field noise caused by a deflected airfoil scrubbed by a subsonic jet. This installation simulated both an under-the-wing and an upper-surface-blowing externally blown flap, depending on the deflection angle. Surface and far field spectra, and cross correlation coherence and delay time, were utilized to infer the major noise-producing mechanisms.

Author

N75-17155*# Scientific Translation Service, Santa Barbara, Calif.

ACOUSTIC WAVE REFLECTION IN THE SUBCRITICAL SECTION OF A LAVAL NOZZLE

N. V. Kokushkin Washington NASA Feb. 1975 21 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Energ. Transp. (USSR), Jul.-Aug. 1974 p 118-128

(Contract NASw-2483)

(NASA-TT-F-16132) Avail: NTIS HC $3.25 CSCL 20A

A method of algebraic equations is derived for determining the reflection characteristics of acoustic waves in the subcritical section of a Laval nozzle during combustion. The coefficient matrix of these equations is used as the basic characteristic of the acoustic property of the nozzle. The amplitudes of reflected acoustic waves are also determined from the applitudes of incident acoustic waves. A linear boundary value problem is solved in the process. Author

N75-17156# Argonnd National Lab., Ill.

LONG WAVELENGTH EXCITATIONS AND THE ATTENUATION OF SOUND IN LIQUID 4He

J. B. Ketterson, B. M. Abraham, and P. R. Roach 1974 44 p refs Presented at the European Topical Conf. on Liquid and Solid Helium, Haifa, Israel, 1-4 Jul. 1974 Sponsored by AEC

(Conf-740725-1) Avail: NTIS HC $3.75

A brief review is given of current understanding of the behavior

of long wavelength excitations in liquid He-4 at very low temperatures and their dependence on pressure. A discussion is given of experiments which probe the excitation spectrum; these include inelastic neutron scattering, heat capacity, thermal conductivity, propagation of super thermal phonons, and sound propagation. Special emphasis is given to sound propagation.
Author (NSA)

N75-17157# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
PARAMETRIC SCALING LAWS. PART 1: AN ANALYTICAL MODEL FOR PREDICTING THE SATURATION LIMITS OF A PARAMETRIC ARRAY Final Report, 1 Feb. - 31 Jul. 1974
E. H. Fenlon 22 Aug. 1974 67 p refs
(Contract N00014-74-C-0214; ARPA Order 2655)
(AD-787839; Rept-72-9M7-NONLN-R2) Avail: NTIS CSCL 20/1

Following a review of the approximate models previously used to provide parametric scaling laws, an exact solution for the asymptotic far-field pressure of a parametric array is derived from the plane wave form of Burgers equation. The influence of spherical spreading losses is then included by matching the solution at low primary wave amplitudes with a spherical wave solution obtained by the method of successive approximation. From the matched asymptotic solution, the referred pressure of the difference-frequency signal at one meter from the source (i.e., the equivalent difference-frequency source level) is derived as a universal function of scaled primary wave amplitudes, frequencies, source dimensions, and physical constants of the medium. With the aid, this function, which defines the saturation limit for a parametric array, the maximum conversion efficiency can be evaluated for a particular set of input parameters. (Modified author abstract) GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-17158# Loughborough Univ. of Technology (England). Dept. of Mathematics.
THE EVALUATION OF TWO-CENTRE MOLECULAR INTEGRALS INVOLVING ONE-ELECTRON GREEN'S FUNCTIONS
M. Blakemore, G. A. Evans, and J. Hyslop Jun. 1974 29 p refs
(MATHS-RES-40) Avail: NTIS HC $3.75

The numerical evaluation of two-center molecular integrals involving one-electron Green's functions was considered. Substantial improvement over earlier results was obtained when semi-analytic methods were employed which reduced the order of multiple quadrature by means of Fourier transform representations. The methods were exemplified by application to the hydrogen molecular ion H-2(+). Integrals arising from two alternative variational functionals were evaluated and the corresponding energy curves compared. ESRO

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N75-17159*# Scientific Translation Service, Santa Barbara, Calif.
MILLIMETER AND SUBMILLIMETER WAVEBAND GYROTRONS
N. I. Zaytsev, T. B. Pankratova, M. I. Petelin, and V. A. Flyagin Dec. 1974 9 p refs Transl. into ENGLISH from Radiotekh. Elektron. (RSSR), no. 5, 1974 p 1056-1060 Prepared for JPL (Contract NAS7-100)
(NASA-TT-F-16162) Avail: NTIS HC $3.25 CSCL 18I

The basic factors which define the specific properties of millimeter and submillimeter waveband gyrotrons are a decrease in the resonator ohmic quality factor and in the limiting currents of adiabatic electron guns with a reduction in the wavelength. It follows from theoretical estimates and experiments that these factors do not prevent the attainment of high efficiencies (on the order of 30 - 40%) in fundamental cyclotron resonance gyrotrons; however, they significantly lower the efficiency of gyrotrons operating at the second harmonic of the cyclotron frequency. Author

N75-17160# Stanford Univ., Calif. Dept. of Physics.
NUCLEAR STRUCTURE INVESTIGATIONS WITH AN FN TANDEM ACCELERATOR Progress Report, 1 Mar. 1973 - 28 Feb. 1974
Stanley S. Hanna and Walter E. Meyerhof Aug. 1974 223 p refs
(Grant NSF GP-37106)
Avail: NTIS HC $7.25

The research for this period is reported. The studies reported include: giant resonances with unpolarized reactions, giant resonances with polarized capture reactions, isobar analog states, Coulomb excitation, heavy-ion reactions, Mossbauer effect on hyperfine interactions, and atomic processes in heavy-ion collisions. F.O.S.

N75-17161# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF VOLUME DISCHARGE EXCITED BY A 10 TO THE MINUS 5TH POWER SECOND DURATION ELECTRON BEAM
Yu. P. Bychkov 6 Jan. 1975 8 p refs Transl. into ENGLISH from Zhj Eksperim. i Teor. Fiz. (Moscow), v. 66, no. 2 1974 p 622-625
(JPRS-63804) Avail: NTIS HC $3.25

An investigation of the volume discharge produced by a beam of fast electrons with a duration of 0.00001 is presented. The volt-ampere characteristics in CO2:N2 are determined for various pressures and discharge power input characteristics. The conditions under which the volume discharge is stable are determined. Author

N75-17162# Indiana Univ., Bloomington. Dept. of Physics.
THEORETICAL PARTICLE PHYSICS Progress Report, 1 Dec. 1972 - 30 Nov. 1973
S. Y. Chu, A. W. Hendry, and D. B. Lichtenberg 30 Nov. 1973 14 p refs
(Contract AT(11-1)-2009)
(COO-2009-57A) Avail: NTIS HC $3.25

Work in theoretical particle physics was done in a variety of subjects. A major effort went into a phenomenological description of high energy elastic scattering. Using an s-channel description in which the partial wave amplitudes were parametrized as smooth functions in impact parameter space, good fits to the differential cross sections and polarizations were obtained. Phenomenological work was also done in characterizing strong interaction resonances. Empirical relations among the masses, widths, and elasticities of resonances were found, and these relations were partially accounted for in terms of the Veneziano model. Further work on resonances was the development of a new parametrization which emphasizes the position of the pole in the relevant S-matrix. Finally, a new approach to five dimensional general relativity was proposed. Author (NSA)

N75-17163# Science Research Council, Chilton (England). Rutherford Lab.
LOW MASS CYLINDRICAL SPARK CHAMBER WITH CAPACITY READ-OUT
G. T. J. Arnison Jun. 1974 12 p refs
(RL-74-094) Avail: AEC Depository Libraries HC $4.00

The manufacture and performance of a J-shaped low mass wire spark chamber is described. The chamber was designed to surround a polarized proton target and cover the maximum acceptance possible inside the magnetic field for studying the antiproton + rising proton yields positive pion + negative pion interaction. The drift due to the magnetic field is discussed.
Author (NSA)

N75-17164# International Radiation Protection Association, Washington, D.C.
PROCEEDINGS OF THE THIRD INTERNATIONAL CONGRESS OF THE INTERNATIONAL RADIATION PROTECTION ASSOCIATION
Walter S. Snyder, ed. Feb. 1974 677 p refs In ENGLISH; RUSSIAN, and FRENCH Conf. held at Washington, D. C., 9-14 Sep. 1973 Sponsored by AEC
(Conf-730907-P2) Avail: NTIS HC $15.25

Radiobiological protection measures and devices are outlined for various kinds of radiation exposures in terms of dosage, shielding, tolerance and health physics. G.G.

N75-17165# California Univ., Livermore. Lawrence Radiation Lab.
ELECTROMAGNETICALLY INDUCED PLASMA BACK CURRENT NEAR THE HEAD OF A RELATIVISTIC ELECTRON BEAM ENTERING GAS
R. J. Briggs, E. J. Lauer, and E. P. Lee 20 Sep. 1974 18 p
(Contract W-7405-eng-48)
(UCID-16594) Avail: NTIS HC $3.25

The dynamics of a self focused relativistic beam entering unionized gas are strongly dependent on the initial rate of generation of conductivity. This conductivity generation is determining the stability of the beam to transverse (hose) modes, and it also enters into the self focusing of the beam by its influence on the generation of back plasma currents. A simple theoretical description is presented of the influence of the conductivity generation near the beam head on the plasma back current. Diagnostic techniques for measuring the beam and plasma currents at different axial locations are developed. Author (NSA)

N75-17166# Utah Univ., Salt Lake City.
POSITION LIFETIME MEASUREMENTS AS A NON-DESTRUCTIVE TECHNIQUE TO MONITOR FATIGUE DAMAGE Technical Progress Report, Jan. 1973 - Dec. 1974
J. G. Byrne Sep. 1974 20 p refs
(Contract AT(11-1)-2128)
(COO-2128-8) Avail: NTIS HC $3.25

Research progress is summarized on fatigue of 4340 steel, electron irradiation, hydrogen embrittlement, and positron lifetime data. NSA

N75-17167# Battelle-Northwest, Richland, Wash.
SNS SOURCE TERM EVALUATION PROGRAM Annual Report
D. K. Craig, W. C. Cannon, R. E. Filipy, D. D. Mahlum, and V. H. Smith Aug. 1974 28 p
(Contract AT(45-1)-1830)
(BNWL-1856) Avail: NTIS HC $3.75

Plutonium-238 is currently being used in the form of a pure refractory oxide as a power source on a number of space vehicles that have already been or will be launched during the next few years. Although the sources are designed and built to withstand re-entry into the earth's atmosphere and impact with the earth's surface without releasing any Pu the possibility of such an event can never be absolutely excluded. Should the capsule fall into the ocean, the corrosive effect of salt waters must be considered. On land, in addition to the possibility of an immediate release from a fractured capsule, the long-term effects of thermal and humidity cycling must be considered. Should (Pu-238)O2 become mixed in a finely divided form with soil, the resuspension characteristics of the Pu in conjunction with the soil and the subsequent aerodynamic behavior of the aerosols will be major factors in determination of the fate of the Pu in the environment. Research studies to evaluate the hazards of Pu-238 released from space nuclear system (SNS) power sources are outlined. Methods used for the co-generation of aerosols of Pu-238 and soils and sampling methods used to determine their transport at various wind speeds are described. NSA

N75-17168# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron Physics.
ACCELERATING PARTICLES IN THE MICROTRON BY NON-SINUSOIDAL FIELD
S. Rosander Sep. 1974 37 p refs
(TRITA-EPP-74-16) Avail: NTIS HC $3.75

A theory for accelerating particles in a microtron by means of an RF field with nonsinusoidal time variation is presented, and an experiment with a 7 MeV microtron is described. It is shown theoretically that the phase acceptance of a microtron can be considerably increased if the accelerating RF field is composed of a fundamental frequency and one of its higher harmonics. The possible increase in power efficiency is nevertheless moderate due to higher cavity losses and to the fact that the extra acceptance is gained via a deceleration of the useful beam. Some simple experiments show that the two frequency microtron works according to the theory and that the overtone part of the accelerating structure can operate without external excitation. ESRO

74 OPTICS

Includes light phenomena.

N75-17169# Defence Research Establishment Valcartier (Quebec).
SUPERFLUORESCENCE AND PARASITIC OSCILLATION IN HIGH-GAIN OPTICAL AMPLIFIERS
J. L. Lachambre, P. Lavigne, M. Blanchard, and G. Otis Mar. 1974 17 p refs
(DREV-TN-2119/74) Avail: NTIS HC $3.25

The superfluorescence equation corresponding to a two-level system is derived for three different lineshapes: the Gaussian, the Lorentzian and the flat-top profile. The results of the calculations reveal the existence of a sharp transition zone between the normal fluorescence and the superfluorescence regimes. A superfluorescence threshold is defined and its value is compared to that of the oscillation threshold relative to various types of possible optical feedback such as reflection due to index gradients or backscattering from small spheres and from the edges of an iris. Author

N75-17170# Wisconsin Univ., Madison. Dept. of Physics.
SIMPLE APPROACH TO ANALYZING BASIC OPTICAL INSTRUMENTS Progress Report, 15 Jul. 1973 - 15 Jul. 1974
B. Durand and P. R. Moran 15 Jul. 1974 13 p
(Contract AT(11-1)-1105)
(COO-1105-210) Avail: NTIS HC $3.25

An approach to teaching about optical instruments is given. It is pointed out that all geometrical optical instruments can be understood as the cascading of three basic instruments: the camera, the projector, and the adjustable magnifier. NSA

N75-17171# Sandia Labs., Albuquerque, N.Mex.
VISIBLE ARCS OF A CIRCULAR ARC VIEWED THROUGH A WINDOW
D. P. Peterson Oct. 1974 40 p refs
(Contract AT(29-1)-789)
(SAND-74-0143) Avail: NTIS HC $3.75

VISARC is a FORTRAN subroutine that calculates those portions of a circular arc that are visible through a rectangular window. For each visible arc it determines the radian measure and the starting position of the arc. Author (NSA)

N75-17172# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.
EVALUATION OF IMAGE RECEPTORS CONSIDERED FOR THE FAUST PROGRAM [RAPPORTS SUR LES EVALUATIONS DES RECEPTEURS D'IMAGES ENVISAGES DANS LE PROGRAMME FAUST]
J. M. Deharveng, M. Barreau, Cohendet, M. Durand, and Gouble 21 Dec. 1972 16 p In FRENCH
(LAS-FAU-Elec-1) Avail: NTIS HC $3.25

The evaluation of two image intensifiers for inclusion in the FAUST program is presented. The tubes require electrostatic focusing with plane image field in the ultraviolet. A Bendix and a Thomson tube were evaluated. The evaluation conditions are given and the equivalent quantum yield was determined. The energy gain as compared to photographic emulsion was calculated, leading to a value of the limit magnitude. The resolution was measured and nonlinearities discussed. The utilization of photomet-

ric measurements is reviewed in regard to the preceeding measurements and steps for further tests are presented. ESRO

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-17173 Polish Academy of Sciences, Warsaw.
THE STRUCTURE OF MAGNETO-GAS DYNAMIC SHOCK WAVES [O ISTNIENIU I JEDNOZNACZNOSCI STRUKTURY MAGNETOGAZODYNAMICZNYCH FAL UDERZENIOWYCH]
Jan Skiepko 12 Dec. 1973 27 p refs In POLISH
(Rept-52/1973) Avail: Issuing Activity

Magnetohydrodynamic shock waves are discussed along with their structural and dynamic characteristics. It was found that dispersion coefficients are positive functions of the physical parameters of these waves. Equations are presented which describe the structure of plane shock waves. Other topics discussed include the perturbation theory and thermodynamics.
Transl. by M.J.S.

N75-17174# Los Alamos Scientific Lab., N.Mex.
EVIDENCE OF ANOMALOUSLY REDUCED ELECTRON THERMAL CONDUCTION IN LASER-PRODUCED PLASMAS
A. W. Ehler, D. V. Giovanielli, R. P. Godwin, G. H. McCall, R. L. Morse, and S. D. Rockwood Apr. 1974 6 p refs
(Contract W-7405-eng-36)
(LA-5611-MS) Avail: NTIS HC $3.25

Experimental results and complimentary theoretical arguments are presented which suggest that electron thermal conduction in laser produced plasmas is anomalously reduced. This reduction is thought to occur in the low density plasma near the critical surface when absorbed power densities are sufficiently large and to be caused by the counterstreaming of cold electrons relative to ions required by thermal conduction. Author (NSA)

N75-17175# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.
POPULATIONS OF EXCITED HYDROGEN AND HELIUM ATOMS IN PLASMA IRRADIATED BY A LASER BEAM
H. W. Drawin, F. Emard, B. Dubreuil (Centre de Recherche sur la Physique des Hautes Temperatures, Orleans), and J. Chapelle (Centre de Recherche sur la Physique des Hautes Temperatures, Orleans) Jan. 1974 50 p refs
(EUR-CEA-FC-729) Avail: AEC Depository Libraries HC $5.50

The populations of excited hydrogen and helium atoms in non-lte plasmas were calculated for two different physical situations, namely (1) no external radiation field present, and (2) strong superposed radiation originating from a CO2, ruby or argon ion laser. The radiation field intervenes in the collisional-radiative model via two new terms, i.e., photoionization and stimulated recombination induced by the laser radiation field. The solutions of the rate equations yield a lowering of the populations when a plasma is irradiated by a laser beam. The lowering is different for cold recombining and hot diffusion-dominated plasmas. At high radiation densities a saturation effect occurs, since the photoionization rate becomes equal to the rate of stimulated recombination. Measurements of the populations of excited H and He atoms in a glow discharge irradiated by a CO2 laser beam of power density 100,000 W/sq cm are in broad agreement with the theoretical predictions. NSA

N75-17176# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
POWER BALANCE AND MECHANICAL STRESSES OF INTERNAL CONDUCTOR SYSTEMS
B. Lehnert 5 Aug. 1974 39 p refs
(TRITA-EPP-74-15) Avail: NTIS HC $3.75

Technological problems of coils in internal conductor systems were investigated. At technically feasible power levels and linear dimensions the ohmic power losses can, under optimized conditions, be made much smaller than the thermonuclear reaction power, even with ordinary metal windings at temperatures of some hundred degrees centigrade. Thus, superconducting coils should not become necessary. The mechanical stresses can be kept well below the limits of tensile strength of possible coil materials. In addition, both the internal coils and their magnetically shielded supports can be made magnetically force-free in certain cases. These results are due to the fact that high beta values are in principle available in systems with a main poloidal field and that only a fraction of the total magnetic field energy originates from the internal conductors. This provides an important advantage over systems with a main toroidal field. Author (ES 0)

N75-17177# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
RELAXATION TIMES OF PERMEABLE PLASMAS
B. Lehnert 5 Sep. 1974 23 p refs
(TRITA-EPP-74-17) Avail: NTIS HC $3.25

Particle and energy balance of plasmas permeable to neutral gas was considered. Two subclasses of permeable plasmas are defined: dilute plasmas penetrated by neutrals of wall temperature and nondilute plasmas penetrated only by fast neutrals of a temperature comparable to that of the ions. The energy balance of dilute plasmas is strongly affected by plasma-neutral gas and plasma-wall interactions, as well as by the vacuum conditions, especially at long particle and energy containment times such as in the Spherator. The energy balance of nondilute plasmas also becomes affected by these interactions, but only to a limited extent in systems suffering from comparatively large losses such as Tokamaks. Earlier experiments with the Spherator can be explained by classical theory including plasma-neutral gas interaction and need not be interpreted in terms of anomalous diffusion. Thus, the possibilities of the Spherator as a magnetic bottle have to be reconsidered. ESRO

76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N75-17178# Virginia Univ., Charlottesville.
INVESTIGATIONS ON THE BEHAVIOR OF POINT DEFECTS AND DISLOCATIONS Final Report
D. Kuhlmann-Wilsdorf 1974 36 p refs
(Contract AT(40-1)-3108)
(ORO-3108-169) Avail: NTIS HC $3.75

Summaries of research are presented on epitaxy, annealing of vacancies and interstitials, melting, structure of liquids, theory of work hardening and fatigue, theory of dislocation cells, surface stress, surface tension, phase transformations, precipitation, elastic constants, interatomic potentials, and radiation damage. NSA

N75-17179# Kozponti Fizikai Kutato Intezet, Budapest (Hungary).
STRUCTURE OF LASER-IRRADIATED CHALCOGENIDE FILMS
J. Hajto and Gy. Radnoczy Apr. 1974 9 p refs
(KFKI-74-21) Avail: AEC Depository Libraries HC $4.00

Optical switching from the crystalline to the amorphous state was studied in chalcogenide films producing amorphous spots by the help of 60 nsec pulses of a ruby laser. These amorphous written spots can be erased both by laser and electron beams. Electron-microscopic examination of the films shows that the diameters of the amorphous spots are 0.5 microns. The structural properties of these films depend on their thickness.
Author (NSA)

N75-17180# Bendix Corp., Kansas City, Mo.
RAPID TCR TEST METHOD FOR TANTALUM-NITRIDE RESISTIVE FILMS
A. Laudel Oct. 1974 23 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-1167-Rev) Avail: NTIS HC $3.25

Taking two resistance readings, at room temperature and at -196 C when the substrate is submerged in liquid nitrogen provides

a convenient means of measuring the temperature coefficient of resistance (TCR) of tantalum-nitride films. The liquid nitrogen provides a large, controlled temperature differential that can be used conveniently in the production environment. A digital readout tester with only a simple nulling adjustment makes it possible to read the TCR of the film directly on the DVM indicator. This method provides the prompt TCR information feedback necessary to control the tantalum-nitride sputtering process and results in substantial time and materials savings. Author (NSA)

N75-17181# Army Foreign Science and Technology Center, Charlottesville, Va.
AMORPHOUS AND ULTRADISPERSE CRYSTALLINE MATERIALS
K. A. Osipov 27 Apr. 1974 96 p refs Transl. into ENGLISH from the book "Amorfnye i Ultradispersnye Kristallicheskie Materialy" Moscow, Nauka Press, 1972 p 5-75
(AD-786812; FSTC-HT-23-748-74) Avail: NTIS CSCL 20/12

The book sums up experimental and theoretical findings on amorphous and ultradisperse crystalline materials, massive and film types. Present-day concepts on the structure of amorphous materials, temperature stability of these materials, characteristics of their transformation into the crystalline state, and their electrophysical and other properties are discussed. Data on amorphous semiconductor materials, and on amorphous and ultradisperse crystalline materials of metallic systems are presented. Emphasis is placed on inorganic film materials. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N75-17182 British Library Lending Div., Boston Spa (England).
NATURE OF ENTHALPY DISTRIBUTION IN THE CHANNEL OF A LINEAR ARC GAS HEATER
V. P. Terentev Feb. 1974 11 p refs Transl. into ENGLISH from Vestn. Akad. Nauk BSSR Fiz. Energ. Nauk (USSR), no. 1, 1973 p 86-92
(BLL-CE-Trans-6336-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The analytical solution of the equation of the energy in the arc gas heater (AGH) channel is examined with regard being paid to losses due to radial heat conductivity and to the axial convective component. The enthalpy distribution on the radius and axis of the channel within the limits of the arc discharge column is obtained, thus enabling the parameters in the AGH chamber and the parameters of the jet on the nozzle section to be estimated. Author

N75-17183 British Library Lending Div., Boston Spa (England).
COEFFICIENTS FOR MEANING UNSTEADY TEMPERATURE FIELDS FOR INSTANTANEOUS STEADY CONDITIONS
E. M. Goldfarb and V. P. Borodulina 1974 5 p ref Transl. into ENGLISH from Inv. Vyssh. Ucheb. Zaved., Chern Met. (USSR), no. 6, 1974 p 149-151
(BLL-M-25021-(5829.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

General equations were obtained for the meaning coefficients for the heating of plates, solid and hollow cylinders, and spheres with relation to omega, the relationship of the internal radius r-s of a body to its external radius r. The meaning coefficients were used for solving problems involving internal sources of heat when calculating the heating of multi-layer walls. Author

N75-17184# Electricity Council, London (England).
HEAT PUMPS IN LARGE BUILDINGS
H. Juttemann [1974] 27 p Transl. into ENGLISH from Heiz.-Lueft.- Haustechn., (West. Ger.), v. 25, no. 4, Apr. 1974 p 124-130
(OA-Trans-939) Avail: NTIS HC $3.75

A heat pump which can provide heating in the winter and cooling in the summer is proposed for large buildings. The working principles are detailed, and the effective performance factor (ratio of useful heat output to energy expended) is calculated. The utilization of external heat sources, including atmospheric air, river water, ground water, and soil is examined. Economic considerations are discussed. N.E.R.

N75-17185*# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
THERMODYNAMICS AND PHASE SEPARATION OF DENSE FULLY-IONIZED HYDROGEN-HELIUM FLUID MIXTURES
D. J. Stevenson Jan. 1975 34 p refs
(Grants NGR-33-010-188)
(NASA-CR-142109) Avail: NTIS HC $3.75 CSCL 20M

The free energy of a hydrogen-helium fluid mixture is evaluated for the temperatures and densities appropriate to the deep interior of a giant planet such as Jupiter. The electrons are assumed to be fully pressure-ionized and degenerate. In this regime, an appropriate first approximation to the ionic distribution functions can be found by assuming hard sphere interactions. Corrections to this approximation are incorporated by means of the perturbation theory of Anderson and Chandler. Approximations for the three-body interactions and the nonlinear response of the electron gas to the ions are included. It is predicted that a hydrogen-helium mixture, containing 10% by number of helium ions, separates into hydrogen-rich and helium-rich phases below about 8000 K, at the pressures relevant to Jupiter (4-40 Megabars). It is also predicted that the alloy occupies less volume per ion than the separated phases. The equations of state and other thermodynamic derivatives are tabulated. Implications of these results are discussed. Author

N75-17186# Commissariat a l'Energie Atomique, Saclay (France). Dept. de Biologie.
INTERFACIAL STRUCTURES: THERMODYNAMICAL AND EXPERIMENTAL STUDIES OF THE INTERFACIAL MASS TRANSFER Ph.D. Thesis - Paris Univ.
J. E. Morel Sep. 1974 87 p refs In FRENCH
(CEA-R-4596) Avail: AEC Depository Libraries HC $7.50

Hypotheses are presented concerning the structure of the interfacial regions between two immiscible liquid phases. It appears that the longitudinal structure is comparable with that of a crystallized solid and that the transversal structure is nearest to that of a liquid. A thermodynamic treatment of the irreversible phenomena in the interfacial region is presented. The equation of evolution of a system consisting of two immiscible liquid phases is deduced. An experimental verification of the theoretical relations is made and the appearance of a great interfacial resistance that slows down the interfacial mass transfer occurs. Author (NSA)

N75-17187# Sandia Labs., Albuquerque, N.Mex.
PROGRAM CYCLE: A RANKINE CYCLE ANALYSIS ROUTINE
J. P. Abbin and W. R. Leuenberger Oct. 1974 72 p refs
(Contract AT(29-1)-789)
(SAND-74-0099) Avail: NTIS HC $4.25

The computer program CYCLE is described that models and analyzes various Rankine cycle systems including supercritical cycles with or without regeneration and subcritical cycles with or without regeneration and/or super heat. The program will accommodate a variety of working fluids, generating the required thermodynamic properties internally using a modest number of input constants. The program version presented in this report is written in FORTRAN 4 in a conversational mode suitable for timesharing. Author (NSA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-17188*# Chamber of Commerce, Houston, Tex.
PROCEEDINGS OF THE FIRST 1974 TECHNOLOGY TRANSFER CONFERENCE

Albuquerque New Mexico Univ. 1974 486 p refs Conf. held at Houston, Tex., 24-25 Sep. 1974 Sponsored in part by NASA
(NASA-CR-142119) Avail: NTIS HC $12.00 CSCL 14A

Commercially successful applications of NASA developed aerospace technology to industrial processes are discussed. For individual titles, see N75-17189 through N75-17224.

N75-17189* Rockwell International Corp., El Segundo, Calif.
TECHNOLOGY APPLICATION AT ROCKWELL INTERNATIONAL **c85**
C. J. Meechan *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 9-14 (For availability see N75-17188 08-80)
CSCL 14A

Technology diffusion at Rockwell International has progressed from the application of special skills to solve specific problems to the transfer of the required people and skills to allow the commercial divisions to solve their own problems and develop or improve their own products. Our prime effort is concentrated on commercial industrial applications. Rockwell's major emphasis on advanced technology utilization is directed through three operational modes, namely, transfer from technologically developed to underdeveloped organizations within the company; transfer between technologically developed organizations to form new operations within the company; and formation of high technology spin-off organizations beyond the corporate entity. Author

N75-17190* National Aeronautics and Space Administration, Washington, D.C.
TECHNOLOGY PIPELINE **c85**
R. M. Voris *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 15-22 (For availability see N75-17188 08-80)
CSCL 14A

After ten years of evolution, the technology utilization program now uses three basic and complementary technology transfer mechanisms: publication, technical assistance dissemination, and application demonstrations. The marketing of NASA technology and industrial applications is discussed. Author

N75-17191* Dvorkovitz and Associates, Ormand Beach, Fla.
COMPUTERS AND TERMINALS AS AN AID TO INTERNATIONAL TECHNOLOGY TRANSFER **c85**
William T. Sweeney *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 23-26 (For availability see N75-17188 08-80)
CSCL 14A

As technology transfer becomes more popular and proves to be an economical method for companies of all sizes to take advantage of a tremendous amount of new and available technology from sources all over the world, the introduction of computers and terminals into the international technology transfer process is proving to be a successful method for companies to take part in this beneficial approach to new business opportunities. Author

N75-17192* Pegasus International Corp., New York.
MAXIMIZING PROFITS IN INTERNATIONAL TECHNOLOGY TRANSFER **c85**
Win Straube *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 27-34 (For availability see N75-17188 08-80)
CSCL 14A

Maximum profit can be introducdd into international technology transfer by observing the following: (1) ethical and open dealing between the parties; (2) maximum knowledge of all facts concerning the technology, the use of the technology, the market, competition, prices, and alternatives; (3) ability to coordinate exports, service, support activities, licensing and cross licensing; and (4) knowledgeable people which put these factors together. Author

N75-17193* Environmental Protection Agency, Washington, D.C.
THE ENVIRONMENTAL PROTECTION AGENCY INDUSTRIAL TECHNOLOGY TRANSFER PROGRAM **c85**
Kenneth H. Suter *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 35-42 (For availability see N75-17188 08-80)
CSCL 13B

Today TAC consists of a full service information center and five programs, which are: (1) our industrial program; (2) the energy information center; (3) the business and industry extension program; (4) the remote sensing program; and (5) the center for environmental research and development. Author

N75-17194* New Mexico Univ., Albuquerque.
THE ROLE OF THE TECHNOLOGY APPLICATION CENTER IN THE TECHNOLOGY TRANSFER PROGRAM **c85**
William A. Shinnick and Nancy M. Grogan *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 43-50 (For availability see N75-17188 08-80)
CSCL 14B

The need for and use of an active technology dissemination program by the Environmental Protection Agency is elaborated. The complexities associated with arriving at an acceptable solution to an environmental problem are addressed, and the mechanisms and associated products used by the technology transfer program to transfer the latest viable technological alternatives to the potential user are explained. Author

N75-17195* National Aeronautics and Space Administration, Washington, D.C.
TRANSFER OF SPACE TECHNOLOGY TO INDUSTRY **c85**
Jeffrey T. Hamilton *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 51-60 (For availability see N75-17188 08-80)
CSCL 13H

Some of the most significant applications of the NASA aerospace technology transfer to industry and other government agencies are briefly outlined. The technology utilization program encompasses computer programs for structural problems, life support systems, fuel cell development, and rechargeable cardiac pacemakers as well as reliability and quality research for oil recovery operations and pollution control. G.G.

N75-17196* Rocketdyne, Canoga Park, Calif.
ROCKET ENGINE HEAT TRANSFER AND MATERIAL TECHNOLOGY FOR COMMERCIAL APPLICATIONS **c44**
John Hiltabiddle and John Campbell *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 61-88 (For availability see N75-17188 08-80)
CSCL 10A

Liquid fueled rocket engine combustion, heat transfer, and material technology have been utilized in the design and development of compact combustion and heat exchange equipment intended for application in the commercial field. An initial application of the concepts to the design of a compact steam generator to be utilized by electrical utilities for the production of peaking power is described. Author

N75-17197* Denver Research Inst., Colo.
APPLICATIONS OF AEROSPACE TECHNOLOGY IN THE ELECTRIC POWER INDUSTRY **c44**
F. Douglas Johnson and Conrad F. Heins *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 89-96 ref (For availability see N75-17188 08-80)
CSCL 10B

Existing applications of NASA contributions to disciplines such as combustion engineering, mechanical engineering, materials science, quality assurance and computer control are outlined to illustrate how space technology is used in the electric power industry. Corporate strategies to acquire relevant space technology are described. Author

N75-17198* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INTEGRATED UTILITY SYSTEM DESIGN CONCEPT **c85**
Edward L. Hays *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 97-106 (For availability see N75-17188 08-80)
CSCL 10B

Conceptual design studies are performed to investigate the feasibility of the MIUS concept as an alternate method of providing

utility services to communities and/or community facilities having advantages over current practices. Procured and operated is a large scale testbed of the MIUS concept in order to evaluate and test those integrated system technical details that do not lend themselves to analysis. These include materials compatibility, process instrumentation and control, predictability of water and air effluents, techniques of heat recovery, method of thermal distribution, etc. Author

N75-17199* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE MIST (MINUS INTEGRATION AND SUBSYSTEMS TEST) LABORATORY: A TESTBED FOR THE MIUS (MODULAR INTEGRATED UTILITY SYSTEM) PROGRAM c85
W. S. Beckham, Jr. and F. A. Keune *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 107-120 (For availability see N75-17188 08-80)
CSCL 10B

The MIUS program develops an economically feasible integrated utility system. The MIUS concept integrates utility services in order to achieve resource, energy and environmental benefits. A testbed integrated utility system, called the MIST laboratory, was completed early in 1974 and has begun a long term program to develop data for MIUS. A description of the MIST is presented and the critical design issues which can only be verified by test, are discussed in detail. Author

N75-17200* Houston Univ., Tex.
ENERGY RECOVERY FROM SOLID WASTE c44
Charles Dalton and C. J. Huang *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 121-132 refs (For availability see N75-17188 08-80)
CSCL 10A

A recent group study on the problem of solid waste disposal provided a decision making model for a community to use in determining the future for its solid waste. The model is a combination of the following factors: technology, legal, social, political, economic and environmental. An assessment of local or community needs determines what form of energy recovery is desirable. A market for low pressure steam or hot water would direct a community to recover energy from solid waste by incineration to generate steam. A fuel gas could be produced by a process known as pyrolysis if there is a local market for a low heating value gaseous fuel. Solid waste can also be used directly as a fuel supplemental to coal in a steam generator. An evaluation of these various processes is made. Author

N75-17201* Chamber of Commerce, Houston, Tex.
ADAPTATIONS OF ADVANCED SAFETY AND RELIABILITY TECHNIQUES TO PETROLEUM AND OTHER INDUSTRIES c44
Paul E. Purser *In its* Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 133-142 refs (For availability see N75-17188 08-80)
CSCL 13H

The underlying philosophy of the general approach to failure reduction and control is presented. Safety and reliability management techniques developed in the industries which have participated in the U.S. space and defense programs are described along with adaptations to nonaerospace activities. The examples given illustrate the scope of applicability of these techniques. It is indicated that any activity treated as a 'system' is a potential user of aerospace safety and reliability management techniques. J.M.S.

N75-17202* Grice Ocean Engineering, Inc., Houston, Tex.
LOCATING UNPERWATER OBJECTS c31
C. Fitzhugh Grice *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 143-152 (For availability see N75-17188 08-80)
CSCL 14B

Underwater search operations are considered to be engineering and operational problems. A process for proper definition of the problem and selection of instrumentation and operational procedures is described. An outline of underwater search instrumentation and techniques is given. J.M.S.

N75-17203* Los Alamos Scientific Lab., N.Mex.
THE INITIATIVES OF THE LOS ALAMOS SCIENTIFIC LABORATORY IN THE TRANSFER OF A NEW EXCAVATION TECHNOLOGY c85
R. J. Hanold, C. A. Bankston, J. C. Rowley, and W. W. Long *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 153-166 refs Sponsored in part by AEC and NSF (For availability see N75-17188 08-80)
CSCL 14A

A system for making vertical or horizontal holes in rock or soil by progressive local melting is described. In one operation the three major tasks of excavation are performed with the Subterrene concept: (1) rock fracturing; (2) debris removal; and (3) wall stabilization. Potential applications of the Subterrene system are indicated, with emphasis on extraction of geothermal energy and development of superconduction transmission lines for electrical power. A program in technology dissemination implemented by the staff members is described. It is indicated that a large scale commercial utilization of the technology is required to complete the transfer of technology. J.M.S.

N75-17204* Boeing Co., Houston, Tex.
SNEAK CIRCUIT ANALYSIS OF INSTRUMENTATION AND CONTROL SYSTEMS c33
John P. Rankin and Alfred M. Williams *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 167-180 refs (For availability see N75-17188 08-80)
CSCL 09C

The evolvement and implementation is presented of a systematic means for detecting the sneak prone designs of an electrical system which could result in such unplanned modes so that they can be prevented prior to occurrence. Sneak circuit analysis is shown to be a formalized approach based upon topological techniques. The trees employed are produced from manufacturing detail data processed by a computer to orderly completion. The analysis techniques applied on a variety of NASA programs are shown to be particularly applicable to industrial instrumentation and control systems. Author

N75-17205* Boeing Co., Wichita, Kans.
AUTOMATED ANALYSIS OF VIDEO DATA c35
Donald J. Hafner *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 181-188 (For availability see N75-17188 08-80)
CSCL 09D

A software/hardware system designed and developed to perform automated video imagery analysis is described. Major elements included in the analysis system are: (1) sampling oscilloscope; (2) programmable trigger unit; (3) central computer; and (4) software processing library. The function of the scope and trigger unit, in conjunction with the control computer, is to digitize the selected portion of the video image and store as amplitude and time data in computer memory. Evaluation of the video data, analogus to interpretation of a visual image, is accomplished by the processing software. It is indicated that this technique of video image analysis is applicable to a wide variety of nonaerospace applications involving video data and image analysis. Author

N75-17206* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APPLICATION OF NARROW-BAND TELEVISION TO INPUSTRIAL AND COMMERCIAL COMMUNICATIONS c33
Bernard C. Embrey, Jr. and Glen R. Southworth (Colorado Video, Inc.) *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 189-199 refs (For availability see N75-17188 08-80)
CSCL 17B

The development of narrow-band systems for use in space systems is presented. Applications of the technology to future spacecraft requirements are discussed along with narrow-band television's influence in stimulating development within the industry. The transferral of the technology into industrial and commercial communications is described. Major areas included are: (1) medicine; (2) education; (3) remote sensing for traffic control; and (5) weather observation. Applications in data processing, image enhancement, and information retrieval are

provided by the combination of the TV camera and the computer. J.M.S.

N75-17207* General Electric Co., Philadelphia, Pa.
IMAGE DATA PROCESSING OF EARTH RESOURCES MANAGEMENT **c43**
A. W. DeSio *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 201-218 (For availability see N75-17188 08-80)
CSCL 08G

Various image processing and information extraction systems are described along with the design and operation of an interactive multispectral information system, IMAGE 100. Analyses of ERTS data, using IMAGE 100, over a number of U.S. sites are presented. The following analyses are included: investigations of crop inventory and management using remote sensing; and (2) land cover classification for environmental impact assessments. Results show that useful information is provided by IMAGE 100 analyses of ERTS data in digital form. J.M.S.

N75-17208* Rice Center for Community Design and Research, Houston, Tex.
THE APPLICATION OF NATURAL SCIENCE DATA TO LAND MANAGEMENT DECISION-MAKING **c43**
Donald L. Williams, Carl P. Sharpe, and Peter G. Rowe *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 219-228 refs (For availability see N75-17188 08-80)
CSCL 08B

A natural environmental analysis process which allows the decision maker to know the probable consequences of a decision prior to the act is developed. Emphasis is placed on the fit between the natural environment and the social, economic, and functional attributes of man's communities and the transition from nature in its present state to various forms and intensities of development. Applications of the analysis are examined. It is concluded that the analysis is a workable system for land use management. J.M.S.

N75-17209* Houston Univ., Tex.
NATIONAL ECONOMIC MODELS OF INDUSTRIAL WATER USE AND WASTE TREATMENT **c45**
Russell G. Thompson and James A. Calloway *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 229-237 (For availability see N75-17188 08-80)
CSCL 13B

The effects of air emission and solid waste restrictions on production costs and resource use by industry is investigated. A linear program is developed to analyze how resource use, production cost, and waste discharges in different types of production may be affected by resource limiting policies of the government. The method is applied to modeling ethylene and ammonia plants at the design stage. Results show that the effects of increasingly restrictive wastewater effluent standards on increased energy use were small in both plants. Plant models were developed for other industries and the program estimated effects of wastewater discharge policies on production costs of industry. J.M.S.

N75-17210* Houston Univ., Tex.
ECONOMIC MODELING AND ENERGY POLICY PLANNING **c44**
Russell G. Thompson, Andrew Schwartz, Jr., Rodrigo J. Lievano, and John C. Stone *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 239-243 (For availability see N75-17188 08-80)
CSCL 10A

A structural economic model is presented for estimating the demand functions for natural gas and crude oil in industry and in steam electric power generation. Extensions of the model to other commodities are indicated. Author

N75-17211* TRW Systems Group, Redondo Beach, Calif.
APPLICATION OF ADVANCED SIGNAL PROCESSING TECHNIQUES TO THE RECTIFICATION AND REGISTRATION OF SPACEBORNE IMAGERY **c43**
R. H. Caron, S. S. Rifman, and K. W. Simon *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 245-255 refs (For availability see N75-17188 08-80)
CSCL 08G

The development of an ERTS/MSS image processing system responsive to the needs of the user community is discussed. An overview of the TRW ERTS/MSS processor is presented, followed by a more detailed discussion of image processing functions satisfied by the system. The particular functions chosen for discussion are evolved from advanced signal processing techniques rooted in the areas of communication and control. These examples show how classical aerospace technology can be transferred to solve the more contemporary problems confronting the users of spaceborne imagery. Author

N75-17212* Dresser Industries, Inc., Dallas, Tex.
THE CHALLENGES OF TECHNOLOGY TRANSFER **c85**
John N. Hazelwood *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 259-264 (For availability see N75-17188 08-80)
CSCL 14A

Observations of challenges of technology transfer are presented with emphasis placed on the position of industry seeking technology through the media of technology searches. Factors considered are: (1) not-invented-here syndrome; (2) penetration of technological literature; (3) gap between origin and industry use; (4) large aerospace manufacturer vs. the small manufacturer; (5) link between the technology disseminator and the potential user; (6) feasibility of substitutions in terms of production costs; and (7) role of patents. It is shown that industry, government agencies, and others having technology to disseminate or use, must mutually understand the technology tools and translate to one another's capabilities, in order to profit from this national resource. J.M.S.

N75-17213* Telecare Inc., Houston, Tex.
THE PROCESSING AND TRANSMISSION OF EEG DATA **c52**
A. E. Schulze *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 267-272 refs (For availability see N75-17188 08-80)
CSCL 06E

Interest in sleep research was stimulated by the discovery of a number of physiological changes that occur during sleep and by the observed effects of sleep on physical and mental performance and status. The use of the relatively new methods of EEG measurement, transmission, and automatic scoring makes sleep analysis and categorization feasible. Sleep research involving the use of the EEG as a fundamental input has the potential of answering many unanswered questions involving physical and mental behavior, drug effects, circadian rhythm, and anesthesia. Author

N75-17214* Southwest Research Inst., San Antonio, Tex.
MEDICAL BENEFITS FROM THE NASA BIOMEDICAL APPLICATIONS PROGRAM **c52**
John L. Sigmon *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 273-280 (For availability see N75-17188 08-80)
CSCL 06E

To achieve its goals the NASA Biomedical Applications Program performs four basic tasks: (1) identification of major medical problems which lend themselves to solution by relevant aerospace technology; (2) identification of relevant aerospace technology which can be applied to those problems; (3) application of that technology to demonstrate the feasibility as real solutions to the identified problems; and, (4) motivation of the industrial community to manufacture and market the identified solution to maximize the utilization of aerospace solutions to the biomedical community. Author

N75-17215* Texas Univ., Houston.
HYPOBARIC CHAMBER FOR THE STUDY OF ORAL HEALTH PROBLEMS IN A SIMULATED SPACECRAFT ENVIRONMENT **c52**
Lee R. Brown *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 281-286 (For availability see N75-17188 08-80)
CSCL 06B

A hypobaric chamber was constructed to house two

marmo-sets simultaneously in a space-simulated environment for periods of 14, 28 and 56 days which coincided with the anticipated Skylab missions. This report details the fabrication, operation, and performance of the chamber and very briefly reviews the scientific data from nine chamber trials involving 18 animals. The possible application of this model system to studies unrelated to oral health or space missions is discussed. Author

N75-17216* Baylor Univ., Houston, Tex.
IMAGE PROCESSING OF ANGIOGRAMS: A PILOT STUDY **c52**
L. E. Larsen, R. A. Evans, and J. O. Roehm, Jr. *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 287-291 refs (For availability see N75-17188 08-80)
CSCL 06B

The technology transfer application this report describes is the result of a pilot study of image-processing methods applied to the image enhancement, coding, and analysis of arteriograms. Angiography is a subspecialty of radiology that employs the introduction of media with high X-ray absorption into arteries in order to study vessel pathology as well as to infer disease of the organs supplied by the vessel in question. Author

N75-17217* Texas Heart Inst., Houston.
INTERDISCIPLINARY STUDIES ON THE DEVELOPMENT OF NUCLEAR-FUELED CIRCULATORY SUPPORT SYSTEMS: COLLABORATION OF INDUSTRY AND ACADEME **c52**
John C. Norman *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 293-319 refs (For availability see N75-17188 08-80)
CSCL 06B

The purpose of this report is to acquaint the Houston community with specific areas of available technology, both public and private, to demonstrate to industry how this technology may be acquired and put to use to provide new and useful services for man. Much of the technology utilized in the development of nuclear-fueled circulatory support systems in our laboratories has evolved from industry, NASA, and AEC; our projects involve radiation biology, thermodynamics, energy transfers, hemodynamics, hematology, pathology, and surgery. Author

N75-17218* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE TECHNOLOGY IN REMOTE HEALTH CARE **c52**
Norman Belasco *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 321-333 (For availability see N75-17188 08-80)
CSCL 06E

A program for an earth-based remote health service system is discussed as a necessary step for the development and verification of a remote health services spacecraft capability. This demonstration program is described to provide data for developing health care for future manned space missions. M.C.F.

N75-17219* Department of Transportation, Cambridge, Mass.
SIMULATION OF TRAFFIC CONTROL SIGNAL SYSTEMS **c85**
Paul J. Connolly, Patricia A. Concannon, and Robert C. Ricci *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 335-351 refs (For availability see N75-17188 08-80)
CSCL 09D

In recent years there has been considerable interest in the development and testing of control strategies for networks of urban traffic signal systems by simulation. Simulation is an inexpensive and timely method for evaluating the effect of these traffic control strategies since traffic phenomena are too complex to be defined by analytical models and since a controlled experiment may be hazardous, expensive, and slow in producing meaningful results. This paper describes the application of an urban traffic corridor program, to evaluate the effectiveness of different traffic control strategies for the Massachusetts Avenue TOPICS Project. Author

N75-17220* Boeing Co., Wichita, Kans.
FLAIR-FLEET LOCATION AND INFORMATION REPORTING **c85**
Earl R. Norman and Merle E. Dunlap *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 353-361 (For availability see N75-17188 08-80)
CSCL 09D

The FLAIR system, as now produced, automatically updates each vehicle's location and corresponding officer's status once each two seconds and presents this information to police dispatchers in the command and control center. The position of all vehicles available for assignment is displayed on a color video map at each dispatcher's console to an accuracy of 50 feet. This gives the dispatcher a continuous picture of the deployment of the total available force and thus complete command and control of all police under his responsibility. Author

N75-17221* Boeing Vertol Co., Philadelphia, Pa.
DYNAMICS COMPUTATION METHODOLOGY APPLIED TO RAILCAR VIBRATIONS **c85**
Robert R. Vlaminck *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 363-390 refs (For availability see N75-17188 08-80)
CSCL 13F

The analytical models discussed present typical examples of analyses performed to optimize vehicle parameters and solve specific engineering problems. Subjects investigated include: (1) car body structural dynamics, (2) vehicle dynamic motions and loads, and (3) truck equalization. Author

N75-17222* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE TECHNOLOGY APPLICATION PROCESS AS APPLIED TO A FIREFIGHTER'S BREATHING SYSTEM **c54**
Pat B. McLaughlan *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 391-402 (For availability see N75-17188 08-80)
CSCL 06Q

The FBS Program indicated that applications of advanced technology can result in an improved FBS that will satisfy the requirements defined by municipal fire departments. To accomplish this technology transfer, a substantial commitment of resources over an extended period of time has been required. This program has indicated that the ability of NASA in terms of program management such as requirement definition, system analysis, and industry coordination may play as important a role as specific sources of hardware technology. As a result of the FBS program, a sequence of milestones was passed that may have applications as generalized milestones and objectives for any technical application program. Author

N75-17223* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AEROSPACE MATERIALS FOR NONAEROSPACE APPLICATIONS **c24**
Robert L. Johnston and Frederick S. Dawn *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 403-444 refs (For availability see N75-17188 08-80)
CSCL 11D

Many of the flame-resistant nonmetallic materials that were developed for the Apollo and Skylab programs are discussed for commercial and military applications. Interchanges of information are taking place with the government agencies, industries, and educational institutions, which are interested in applications of fire-safe nonmetallic materials. These materials are particularly applicable to the design of aircraft, mass transit interiors, residential and public building constructions, nursing homes and hospitals, and to other fields of fire safety applications. Figures 22, 23 and 24 show the potential nonaerospace applications of flame-resistant aerospace materials are shown. Author

N75-17224* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FIRE-RESISTANT AIRCRAFT MATERIALS DEVELOPMENT AND EVALUATION PROGRAM **c24**
Richard W. Bricker and Robert N. Stuckey *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 445-491 refs (For availability see N75-17188 08-80)
CSCL 11D

The overall objectives of this program are to provide a more fire-resistant commercial aircraft interior and to improve

the fuselage insulation barrier between the cabin interior and an exterior fuel fire. Significant secondary objectives are to reduce the smoke and toxic gas production of the materials and to meet the end item use requirements pertaining to wearability, color fastness, and aesthetic appeal. It is shown that the fuselage insulation materials must meet stringent requirements pertaining to acoustic attenuation, low density, and water repellency.
Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-17225# Federal Aviation Agency, Washington, D.C. Office of Systems Engineering Management.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN. PROGRAM STRUCTURE AND OBJECTIVES
1 Jul. 1974 43 p
(AD-783186; FAA-ED-00-8) Avail: NTIS HC $3.25 CSCL 17/7

The Office of Systems Engineering Management's program plans covering the present twenty-one engineering and development programs within the Federal Aviation Administration are presented. These plans provide detailed information on the objectives, goals, program structure, technical approach, resources, possible implementation, and a number of other aspects for each of these programs. An introductory background to the planning process, the objectives in each of the program areas, and an index of the plans, available or under preparation are presented.
Author

N75-17226# Comptroller Gendral of the United States, Washington, D.C.
PROBLEMS IN MANAGING THE DEVELOPMENT OF AIRCRAFT ENGINES
23 May 1974 36 p refs
(B-179166) Avail: NTIS HC $3.75

The method traditionally followed by the military in developing and acquiring aircraft engines is evaluated in terms of its cost effectiveness. Evidence is presented that aircraft engines require further development of capability, performance and endurance beyond that needed to pass the model qualification test. The budgeting and financing of the component improvement program is detailed. Revisions of the presently used methods are proposed.
N.E.R.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N75-17227# Advisory Group for Aerospace Research and Development, Paris (France).
AGARD INDEX OF PUBLICATIONS, 1971 - 1973
Nov. 1974 420 p refs
Avail: NTIS HC $10.50

An index of publications prepared for the Advisory Group for Aerospace Research and Development (AGARD) during the period 1971 to 1973 is presented. The indexes are based on the NASA computerized data base and abstracts from the N 10,000 series (STAR) and X70,000 series of documents. The five indexes used are as follows: (1) personal author, (2) corporate source, (3) report number, (4) accession number, and (5) subject, based on the NASA Thesaurus nomenclature. The 34 NASA categories are used for document location.
Author

N75-17228# Department of National Defence, Ottawa (Ontario). Research and Development Branch.
AN OUTLINE OF CANADA'S DEFENCE SCIENTIFIC INFORMATION SERVICE
D. A. Ross Jul. 1974 22 p refs
(DSIS-TM-3/74(ODG)) Avail: NTIS HC $3.25

A Canadian defense-oriented scientific information service which collects and disseminates Canadian and foreign scientific and technical information for Canada's defense community is described. Information services such as the current awareness KWOC Index, document digests, and selective dissemination of information (SDI) programs are discussed, and the development of the on-line DSIS retrospective search system is described. The transition from hard copy to microform dissemination is mentioned and the use of minicomputers and the study of a possible information analysis center in the Defense Scientific Information Service (DSIS) are outlined as part of the research and development activities of DSIS. Some comments on the future development of information technology for Canada's defence community are offered.
Author

N75-17229# Advisory Group for Aerospace Research and Development, Paris (France).
THE USE OF MICROFICHES FOR SCIENTIFIC AND TECHNICAL REPORTS. CONSIDERATIONS FOR THE SMALL USER
B. J. S. Williams and R. N. Broadhurst Oct. 1974 27 p refs
(AGARD-AG-198) Avail: NTIS HC $3.75

The report is intended primarily for the small user concerned with the use of microfiches for scientific and technical report material. The small user is considered to be the individual engineer or project worker or, at most, the small company, department or project team handling microfiches on a modest scale. While emphasis has been placed on the use of microfiches-their reading, duplication, print out and storage - some general information was included on the production of microfiches. The type of microfiche containing 60 or 98 frames used for the reproduction of individual reports is considered. These microfiches are also widely used for reproducing journals and periodicals on an issue-by-issue basis, for individual articles, monographs or papers and, less exclusively, for parts lists and maintenance manuals.
Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-17230# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ECONOMIC EVALUATION OF THE PROPOSED ILLINOIS COMPLEX SOURCE REGULATION
A. S. Cohen, J. F. Tschanz, and R. K. Seyfreid (Westenhoff and Norvick, Inc.) Aug. 1974 155 p
(Contract W-31-109-eng-38; Grants NSF AG-352; NSF GI-3298)
(ANL/ES-36; EQ-74-49) Avail: NTIS HC $6.25

Comparisons are made of the costs of the federal indirect source and the proposed Illinois complex source regulations. The analysis, delay, modification, and phasing costs associated with the regulations are discussed, and all but the phasing costs are the most important. Regional shopping centers incur the largest relative costs. Various parametric analyses are conducted to determine the sensitivity of the cost estimates to the apportionment scheme used in the regulation and to the federal new-car emission standards.
Author (NSA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-17231# Royal Aircraft Establishment, Farnborough (England).
CABTRACK STUDIES. CAB LAYOUT AND GUIDANCE
M. K. Eley, B. C. Joyce, J. C. Longrigg, and J. D. Williams May 1972 121 p refs
(RAE-TR-72047; BR29243) Avail: NTIS HC $5.25

The principles which determine the mechanical layout of Cabtrack vehicles are described. General design requirements are stated and the potentialities of novel solutions are examined. These include vehicle support without the use of wheels; air cushions, magnetic repulsion and alternative vehicle/track configurations (suspended cabs, sidemounted cabs). The problem of switching closely spaced vehicles at junctions is shown to be a major criterion in assessing the practicability of these many possibilities. The more novel methods are shown to have considerable drawbacks, and, at these relatively low speeds, appear to have no overall advantages. Alternative layouts using relatively conventional ideas are described, and the results of preliminary dynamic studies on these designs are presented. Author (ESRO)

N75-17232# Rhode Island Univ., Kingston. Dept. of Chemical Engineering.
CONCENTRATION OF INDUSTRIAL WASTE BY DIRECT OSMOSIS Final Report
Ferdinand Votta, Jr. 30 Jun. 1974 18 p refs
(Contract DI-14-31-0001-4040)
(PB-236468/5; W74-13055; OWRR-A-049-RI-1) Avail: NTIS HC $3.25 CSCL 07A

A study has been made of the feasibility of using direct osmosis at atmospheric pressure as a means of concentrating dilute industrial wastes. Waste solutions were concentrated by the permeation of water through an osmotic membrane to sea water, whose pressure was less than that of the waste solutions. None of the commercially available reverse osmosis membranes tested were found suitable. The water permeation rates were low, and the salt rejection was poor. The concentrated waste solutions were contaminated by an appreciable quantity of sodium chloride and relatively large quantities of metallic ions were lost in the diluted sea water during the concentration of metallic waste solutions. GRA

N75-17233# Transportation Systems Center, Cambridge, Mass.
ANALYSIS OF DUAL MODE SYSTEMS IN AN URBAN AREA. VOLUME 2: STUDY RESULTS Final Report, Aug. 1971 - Aug. 1972
Peter Benjamin, J. Barber, R. Favout, D. Goeddel, and C. Heaton Dec. 1973 241 p refs Revised
(PB-236426/3; DOT-TSC-OST-73-16A-Vol-2) Avail: NTIS HC $7.50 CSCL 13F

Various forms of dual mode transportation were analyzed in order to assess the economic viability of the dual mode concept. Specially designed new small dual mode vehicles, modifications of existing automobiles, and pallet systems, all operating in conjunction with dual mode buses, were examined. The study was conducted in a Boston 1990 scenario, in which an extensive dual mode system providing service for the entire urban region was presumed to exist. The following conclusions are made about its application to other cities: (1) dual mode systems appear to be sufficiently attractive to warrant further technological development; (2) for urban-wide applications, a dual mode system which includes both buses and personal vehicles is more effective than one consisting of either fleet of vehicles alone; and (3) a dual mode transportation system benefits from the use of various dual mode concepts throughout its development. Author

N75-17234# Transportation Systems Center, Cambridge, Mass.
ANALYSIS OF DUAL MODE SYSTEMS IN AN URBAN AREA. VOLUME 3: DESCRIPTION OF THE ANALYSIS TECHNIQUES AND DATA SOURCES Final Report, Aug. 1971 - Aug. 1972
Peter Benjamin, J. Barber, R. Favout, D. Goeddel, and C. Heaton Dec. 1973 343 p refs Revised
(PB-236427/1; DOT-TSC-OST-73-16A-Vol-3) Avail: NTIS HC $9.50 CSCL 13F
For abstract, see N75-17233.

N75-17235# Transportation Systems Center, Cambridge, Mass.
ANALYSIS OF DUAL MODE SYSTEMS IN AN URBAN AREA. VOLUME 3A: APPENDIXES Final Report, Aug. 1971 - Aug. 1972
Peter Benjamin, J. Barber, R. Favout, D. Goedell, and C. Heaton Dec. 1973 160 p Revised
(PB-236428/9; DOT-TSC-OST-73-16A-Vol-3A) Avail: NTIS HC $6.25 CSCL 13F
For abstract, see N75-17233.

N75-17189* Rockwell International Corp., El Segundo, Calif.
TECHNOLOGY APPLICATION AT ROCKWELL INTERNATIONAL
C. J. Meechan *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 9-14 (For availability see N75-17188 08-80)
CSCL 14A

N75-17190* National Aeronautics and Space Administration, Washington, D.C.
TECHNOLOGY PIPELINE
R. M. Voris *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 15-22 (For availability see N75-17188 08-80)
CSCL 14A

N75-17191* Dvorkovitz and Associates, Ormand Beach, Fla.
COMPUTERS AND TERMINALS AS AN AID TO INTERNATIONAL TECHNOLOGY TRANSFER
William T. Sweeney *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 23-26 (For availability see N75-17188 08-80)
CSCL 14A

N75-17192* Pegasus International Corp., New York.
MAXIMIZING PROFITS IN INTERNATIONAL TECHNOLOGY TRANSFER
Win Straube *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 27-34 (For availability see N75-17188 08-80)
CSCL 14A

N75-17193* Environmental Protection Agency, Washington, D.C.
THE ENVIRONMENTAL PROTECTION AGENCY INDUSTRIAL TECHNOLOGY TRANSFER PROGRAM
Kenneth H. Suter *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 35-42 (For availability see N75-17188 08-80)
CSCL 13B

N75-17194* New Mexico Univ., Albuquerque.
THE ROLE OF THE TECHNOLOGY APPLICATION CENTER IN THE TECHNOLOGY TRANSFER PROGRAM
William A. Shinnick and Nancy M. Grogan *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 43-50 (For availability see N75-17188 08-80)
CSCL 14B

N75-17195* National Aeronautics and Space Administration, Washington, D.C.
TRANSFER OF SPACE TECHNOLOGY TO INDUSTRY
Jeffrey T. Hamilton *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 51-60 (For availability see N75-17188 08-80)
CSCL 13H

N75-17198* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INTEGRATED UTILITY SYSTEM DESIGN CONCEPT

Edward L. Hays *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 97-106 (For availability see N75-17188 08-80)
CSCL 10B

N75-17199* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE MIST (MINUS INTEGRATION AND SUBSYSTEMS TEST) LABORATORY: A TESTBED FOR THE MIUS (MODULAR INTEGRATED UTILITY SYSTEM) PROGRAM
W. S. Beckham, Jr. and F. A. Keune *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 107-120 (For availability see N75-17188 08-80)
CSCL 10B

N75-17203* Los Alamos Scientific Lab., N.Mex.
THE INITIATIVES OF THE LOS ALAMOS SCIENTIFIC LABORATORY IN THE TRANSFER OF A NEW EXCAVATION TECHNOLOGY
R. J. Hanold, C. A. Bankston, J. C. Rowley, and W. W. Long *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 153-166 refs Sponsored in part by AEC and NSF (For availability see N75-17188 08-80)
CSCL 14A

N75-17212* Dresser Industries, Inc., Dallas, Tex.
THE CHALLENGES OF TECHNOLOGY TRANSFER
John N. Hazelwood *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 259-264 (For availability see N75-17188 08-80)
CSCL 14A

N75-17219* Department of Transportation, Cambridge, Mass.
SIMULATION OF TRAFFIC CONTROL SIGNAL SYSTEMS
Paul J. Connolly, Patricia A. Concannon, and Robert C. Ricci *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 335-351 refs (For availability see N75-17188 08-80)
CSCL 09D

N75-17220* Boeing Co., Wichita, Kans.
FLAIR-FLEET LOCATION AND INFORMATION REPORTING
Earl R. Norman and Merle E. Dunlap *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 353-361 (For availability see N75-17188 08-80)
CSCL 09D

N75-17221* Boeing Vertol Co., Philadelphia, Pa.
DYNAMICS COMPUTATION METHODOLOGY APPLIED TO RAILCAR VIBRATIONS
Robert R. Vlaminck *In* Chamber of Commerce Proc. of the 1st 1974 Technol. Transfer Conf. 1974 p 363-390 refs (For availability see N75-17188 08-80)
CSCL 13F

88 SPACE SCIENCES (GENERAL)

N75-17236*# National Aeronautics and Space Administration, Washington, D.C.
THE RINGS OF SATURN
Frank Don Palluconi, ed. and Gordon H. Pettengill, ed. 1974 221 p refs Presented at the Saturn's Rings Workshop, Pasadena, Calif., 31 Jul. - 1 Aug. 1973
(NASA-SP-343) Avail: NTIS MF $2.25; SOD HC $3.25 CSCL 03B

The upcoming Mariner Jupiter-Saturn '77 space project is discussed. The variations in radar and radio observations are evaluated, along with particle distribution within the Saturn rings. For individual titles, see N75-17237 through N75-17253.

N75-17237* Smithsonian Astrophysical Observatory, Cambridge, Mass.
STRUCTURE OF SATURN'S RINGS: OPTICAL AND DYNAMICAL CONSIDERATIONS c90
Fred A. Franklin *In* NASA, Washington The Rings of Saturn 1974 p 3-15 refs (For availability see N75-17236 08-88)
CSCL 03B

The photometric phase curves of Saturn's rings are considered, as well as a conflict between dynamical and photometric models of the rings. The dependence of ring brightness on angular separation of the earth and sun as viewed from Saturn is discussed. The nonlinear brightness surge is interpreted. Some quantitative calculations were carried out for bodies in and near the asteroidal belt. Predicted density profiles of the ring obtained with Mimas in an eccentric orbit and in a circular orbit are also included. J.A.M.

N75-17238* Massachusetts Univ., Amherst.
MODEL OF SATURN'S RINGS THAT SATISFIES THE OBSERVED PHASE CURVE FOR OPTICAL SCATTERING c90
William M. Irvine *In* NASA, Washington The Rings of Saturn 1974 p 17-28 refs (For availability see N75-17236 08-88)
CSCL 03B

The effects of multiple anisotropic scattering were calculated, including the solar penumbra effect for shadowing computations. The classical model was matched to observations, including the wavelength dependence, by varying the particle albedo as a function of wavelength. A scattering diagram is also presented showing the relative amount of primary and higher-order scattering necessary to match the B ring brightness and the shape of the phase curve. J.A.M.

N75-17239* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SATURN'S RING PARTICLES AND SPACE VEHICLE DESIGN c90
Frank Don Palluconi *In* NASA, Washington The Rings of Saturn 1974 p 29-38 refs (For availability see N75-17236 08-88)
CSCL 03B

Spacecraft design is discussed for probing Saturn's rings. Ring particles are also considered, emphasizing material outside of ring A and the hazard this might imply to a spacecraft crossing the ring plane beyond ring A. Author

N75-17240* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
IMPACT OF SATURN'S RINGS ON MISSION ANALYSIS FOR MJS 77 c13
Paul A. Penzo *In* NASA, Washington The Rings of Saturn 1974 p 39-50 (For availability see N75-17236 08-88)
CSCL 22A

Mariner Jupiter-Saturn '77 mission objectives for Saturn are considered which affect the trajectory design and in particular the aim point at Saturn. These objectives include the following: (1) earth, sun occulation of Saturn, rings, and satellites; (2) close as possible to surface; (3) close as possible to rings; (4) close encounter with Titan (approximately 20,000 km); (5) close encounter with Iapetus; (6) multiple satellite encounters; (7) post-Saturn trajectory to Uranus; and (8) post-Saturn trajectory toward solar apex. J.A.M.

N75-17241* California Univ., Los Angeles.
RING PARTICLE SIZES AND COMPOSITION DERIVED FROM ECLIPSE COOLING CURVES AND REFLECTION SPECTRA c90
Hugh H. Kieffer *In* NASA, Washington The Rings of Saturn 1974 p 51-63 refs (For availability see N75-17236 08-88)
CSCL 03B

The probable chemistry of the Saturn rings is reviewed. Reflectance spectra for H2O and NH3 frosts and Saturn's rings are compared, along with temperature dependence of 1.6 microns water frost feature. The reflection spectra of Galilean satellite J2 and water frost are also reviewed. J.A.M.

N75-17242* Hawaii Univ., Honolulu.
VARIATIONS IN THE INFRARED BRIGHTNESS TEMPERATURE OF SATURN'S RINGS c90
Robert E. Murphy *In* NASA, Washington The Rings of Saturn 1974 p 65-72 refs (For availability see N75-17236 08-88)
CSCL 03B

After adjusting for the decreased Sun-Saturn distance and adjusting all measurements to B ring values only, it is shown

that the temperature variations are not as large as was thought. Various models of the multilayer agglomerate of particles of Saturn's rings are evaluated. It is recommended that the difference between the 11 and 20 micron brightness temperatures should be explained by a satisfactory model. J.A.M.

N75-17243* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DISTRIBUTION AND SIZE OF ELEMENTS OF SATURN'S RINGS AS INFERRED FROM 12-cm RADAR OBSERVATIONS **c90**
George A. Morris, Jr. *In* NASA, Washington The Rings of Saturn 1974 p 73-82 refs (For availability see N75-17236 08-88)
CSCL 03B

A 64m radar antenna was used to observe Saturn's rings at 12.6 cm wavelength, with reduced Doppler spread. The results show a positive radar return corresponding to about a 60 percent return from an isotropic scatterer with the projected area of the rings, allowing for the Cassini division. A radar spectrogram of the rings is shown with power density plotted against Doppler frequency shift. J.A.M.

N75-17244* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SHORT WAVELENGTH RADIO OBSERVATIONS OF SATURN'S RINGS **c89**
Michael A. Janssen *In* NASA, Washington The Rings of Saturn 1974 p 83-96 refs (For availability see N75-17236 08-88)
CSCL 03A

Passive radio observations are discussed from 1 mm to 2 cm wavelengths. The interferometric technique was used to observe the brightness of the rings. The reflectivity and disk temperature are also considered. The differences between radio and radar observations are examined and discussed. J.A.M.

N75-17245* California Inst. of Tech., Pasadena.
MICROWAVE INTERFEROMETRY OF SATURN: APPLICATION TO THE BRIGHTNESS TEMPERATURE OF THE RINGS **c89**
Glenn L. Berge *In* NASA, Washington The Rings of Saturn 1974 p 97-105 refs (For availability see N75-17236 08-88)
CSCL 03A

Radio interferometric measurements of Saturn and Saturn's rings are explained. The measurements are limited to Mu is greater than or equal to 3. Data are also given on visibility functions, flux density, and brightness temperature. E.H.W.

N75-17246* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ESTIMATES OF THE SIZE OF PARTICLES IN SATURN'S RINGS AND THEIR COSMOGONIC IMPLICATIONS **c90**
James B. Pollack *In its* The Rings of Saturn 1974 p 107-123 refs (For availability see N75-17236 08-88)
CSCL 03B

Near infrared ice band measurements, radar and radio observations, and implications of the size estimates of particles in Saturn's rings are discussed. The measurements are compared to the Poynting-Robetson effect and a possible mechanism by which the size of the particles may significantly change after the initial formulation of the material in the rings is proposed. E.H.W.

N75-17247* Centre National d'Etudes Spatiales, Paris (France).
THE ATMOSPHERE OF THE RINGS OF SATURN **c90**
Jacques Blamont *In* NASA, Washington The Rings of Saturn 1974 p 125-129 refs (For availability see N75-17236 08-88)
CSCL 03B

Outgassing of H and OH from Saturn's rings and the possibility of detecting it are examined. The source gas around the rings is computed after which the products of ice, H_2O, H, and OH and the physical mechanisms that produce these species are given. Production rates for the ice products are discussed. E.H.W.

N75-17248* Colorado Univ., Boulder.
THE MARINER JUPITER/SATURN PHOTOPOLARIMETER EXPERIMENT **c35**
Charles F. Lillie *In* NASA, Washington The Rings of Saturn 1974 p 131-139 ref (For availability see N75-17236 08-88)
CSCL 14B

Observations of Saturn's rings by the Mariner Jupiter/Saturn photopolarimeter are studied. From these observations attempts were made to: (1) determine the size, shape, albedo, distribution, and orientation of particles in the rings, (2) measure geometric and optical thickness of the rings, and (3) determine the effect of Saturn's satellites on dynamics of ring particles. Special attention was given to stellar and solar occulation measurements, surface brightness photometry, and phase angle dependence of intensity and polarization. E.H.W.

N75-17249* New Mexico Univ., Albuquerque.
THE MARINER JUPITER/SATURN VISUAL IMAGING SYSTEM **c35**
Bradford A. Smith *In* NASA, Washington The Rings of Saturn 1974 p 141-143 (For availability see N75-17236 08-88)
CSCL 14E

Attempts were made to determine the spatial distribution of materials and brightness temperature of Saturn's rings using observations made by the visual imaging system of the Mariner Jupiter/Saturn project. E.H.W.

N75-17250* Kitt Peak National Observatory, Tucson, Ariz.
THE MARINER JUPITER/SATURN ULTRAVIOLET EXPERIMENT **c35**
A. Lyle Broadfoot *In* NASA, Washington The Rings of Saturn 1974 p 145-146 (For availability see N75-17236 08-88)
CSCL 14B

Atmospheric properties of Saturn's rings as measured by an ultraviolet spectrometer onboard the Mariner Jupiter/Saturn probe are studied. Measurements were made of planetary atmospheric radiation, resonance scattered by atomic or molecular constituents, solar spectra, and the absorption characteristics of the atmosphere. Measurements were made in the 400 to 1600 A region. E.H.W.

N75-17251* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE MARINER JUPITER/SATURN IRIS EXPERIMENT **c35**
Thomas E. Burke *In* NASA, Washington The Rings of Saturn 1974 p 147-153 (For availability see N75-17236 08-88)
CSCL 14B

After a schematic representation of the IRIS experiment, objectives of the program are outlined. Specifically data cover: (1) determination of energy balance for Jupiter and Saturn, (2) determination of methane, ammonia, hydrogen and water vapor quantities, (3) three dimensional temperature fields, (4) hydrogen-helium ratios and isotopic ratios of H/C, C/N, and C/O. E.H.W.

N75-17252* State Dept., Washington, D.C.
THE MARINER JUPITER/SATURN RING OCCULTATION EXPERIMENT **c13**
Von R. Eshleman *In* NASA, Washington The Rings of Saturn 1974 p 155-166 (For availability see N75-17236 08-88)
CSCL 22A

Radio occultation measurements of Saturn's rings as measured by the Mariner Jupiter/Saturn radio science experiment are reported. These signal measurements provide information on size, distribution, and density of particle material found in the rings. E.H.W.

N75-17253* General Electric Co., Philadelphia, Pa.
THE SISYPHUS PARTICLE DETECTOR **c35**
Robert K. Soberman *In* NASA, Washington The Rings of Saturn 1974 p 167-173 (For availability see N75-17236 08-88)
CSCL 14B

The particle measurement subsystem planned for the MJS 77 mission is described. Scientific objectives with respect to Saturn's rings are as follows: (1) measure particles outside the visible rings, including particulates orbiting in more distant rings and particles scattered out of visible rings, (2) measure meteoroid environment in vicinity of Saturn, and (3) develop an understanding of the dynamics of the rings with respect to their collisional interaction with the environment. Author

N75-17254*# Scientific Translation Service, Santa Barbara, Calif.
MAN-EARTH-UNIVERSE
V. I. Sevastyanov and A. D. Ursul Washington NASA Jan. 1975 12 p refs Transl. into ENGLISH from Priroda (USSR),

no. 11, Nov. 1974 p 2-5
(Contract NASw-2483)
(NASA-TT-F-16150) Avail: NTIS HC $3.25 CSCL 06B

The investigation of the earth from space and the investigation of space for the benefit of mankind is discussed along with the relationships of the earth and its surroundings to the rest of space. Factors considered are: (1) ecological problems and their relationship to Cosmonautics; (2) space geocentrism; and (3) conquest of space and the earth: a systems approach. It is shown that the key to many of the problems on the Earth may be found in space. J.M.S.

N75-17255# Committee on Science and Astronautics (U. S. House).
THE 1975 NATIONAL SCIENCE FOUNDATION AUTHORIZATION
Washington GPO 1974 867 p refs Hearings on H.R. 12816 (superseded by H.R. 13999) before Subcomm. on Sci., Res., and Develop. of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 28, 12-15 Mar. and 19 Mar. 1974
(GPO-31-787) Avail: Subcomm. on Sci., Res., and Develop.

The basic research programs of the Foundation are reviewed with emphasis on energy-related research. The research supported in the following areas is discussed: earth sciences, oceanography, biological sciences, ecosystems, physics, chemistry, and social sciences. GARP and other specific research programs are described. F.O.S.

N75-17256*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE TECHNOLOGY, ITS INFLUENCE ON SCIENCE AND ENGINEERING
B. Paton Washington NASA Feb. 1975 11 p Transl. into ENGLISH from Avaiat. Kosmonavt. (USSR), no 11, Nov. 1974 p 34-36
(Contract NASw-2483)
(NASA-TT-F-16156) Avail: NTIS HC $3.25 CSCL 22A

Basic directions in the development of space technology are defined. These directions are the scientific tests, technology for making repairs in space, and production of various materials and components in space. Practical examples of these directions are discussed. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-17257*# Wisconsin Univ., Madison. Dept. of Physics.
FABRY-PEROT OBSERVATIONS OF COMET KOHOUTEK Final Technical Report
F. L. Roesler, F. Scherb, D. Huppler, R. J. Reynolds, and J. Trauger 20 Feb. 1975 26 p refs
(Grant NGR-50-002-242)
(NASA-CR-142117) Avail: NTIS HC $3.75 CSCL 03A

Observations of H alpha, H2O(+), and emission lines from comet Kohoutek were made. Analyses of H alpha line profiles and line intensities indicate that the mean outflow velocity of the hydrogen atoms was 7.8 + or - 0.2 km s(-1) and that the hydrogen atom production rate varied for comet-sun distances between 1 AU and 0.4 AU. The identification of an H2O(+) emission feature in certain H alpha scans indicates that the H2O(+) ions were moving in a tailward direction with a velocity of 20 to 40 km s(-1) with respect to the comet nucleus. An upper limit of 1 part in 100 was found for the D/H ratio in the cometary atomic hydrogen cloud. Author

N75-17258*# Lockheed Missiles and Space Co., Palo Alto, Calif. Radiation Physics Lab.
OPTICAL IMAGE OF A COMETARY NUCLEUS: 1980 FLYBY OF COMET ENCKE
W. C. Wells, R. S. Benson, A. D. Anderson, and G. Gal Aug. 1974 61 p refs
(Contract NAS5-20566)
(NASA-CR-139177; LMSC-D430482) Avail: NTIS HC $4.25 CSCL 03A

The feasibility was investigated of obtaining optical images of a cometary nucleus via a flyby of Comet Encke. A physical model of the dust cloud surrounding the nucleus was developed by using available physical data and theoretical knowledge of cometary physics. Using this model and a Mie scattering code, calculations were made of the absolute surface brightness of the dust in the line of sight of the on-board camera and the relative surface brightness of the dust compared to the nucleus. The brightness was calculated as a function of heliocentric distance and for different phase angles (sun-comet-spacecraft angle). Author

N75-17259*# Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.
POLARIZATION OF VENUS: OBSERVATIONS OF SHORT-TERM QUASI-PERIODIC VARIATIONS
Edward Bowell 1974 13 p Presented at the Conf. on the Atmosphere of Venus, New York, 15-17 Oct. 1974
(Grant NGR-03-003-001)
(NASA-CR-142115) Avail: NTIS HC $3.25 CSCL 03A

Observations of the short period variations in ultraviolet polarization and carbon dioxide line intensity for the atmosphere of the planet Venus are discussed. Theoretical polarization-phase curves for the integrated disk of Venus are developed. The amplitude of the short-term variation in the polarization as a function of wavelength is analyzed. Curves are developed to show the relationship between percent polarization and phase angle for various wavelengths. Author

N75-17260# Hiroshima Univ. (Japan). Research Inst. for Theoretical Physics.
GRAVITATIONAL COLLAPSE OF A ROTATING STAR. 2: EXTERIOR FIELD OF A SLOWLY ROTATING COLLAPSING STAR
K. Tomita May 1973 14 p refs
(RRK-73-6) Avail: AEC Depository Libraries

The gravitational exterior field outside a slowly rotating collapsing star is examined. The final field in the course of the collapse is shown to be expressed by a stationary metric which is exactly Kerr's metric, and the other nonstationary parts of the metric damp away in a power law at large time. The case of rapid rotation is also discussed. Author (NSA)

N75-17261# Royal Observatory, Edinburgh (Scotland).
OBSERVATIONS OF PROPER MOTIONS NEAR I EQUALS 140 DEG
R. J. Dodd 1974 26 p refs *Its* Publ. of the Roy. Obs., 1974, v. 9, no. 2
Avail: NTIS HC $3.75; Roy. Obs., Edinburgh £1.50; PHI $5.80

A list of Cartesian coordinates measured by the GALAXY measuring machine, galactic coordinates, proper motion components in galactic longitude and latitude, and U, B, V photometry is presented for 553 stars in a region near the galactic equator at longitude 140 deg. The proper motions were derived by direct mapping of stars from the first epoch astrograph plate to the second epoch Schmidt plate and by use of the AGK3 catalogue as an intermediate stage. The methods of analysis are described and the results of the two reductions compared. Author (ESRO)

N75-17262# Lecce Univ. (Italy). Ist. di Fisica.
UPPER LIMIT FOR CH4 PRODUCTION FROM COMET KOHOUTEK BY HIGH RESOLUTION TILTING-FILTER PHOTOMETRY AT 3.3 MICRONS
C. B. Cosmovici, S. Drapatz (Max-Planck-Inst. fuer Extraterrestrische Phys., Garching, West Ger.), K. W. Michel (Max-Planck-Inst. fuer Extraterrestrische Phys., Garching, West Ger.), A. E. Roche (Lockheed Palo Alto Res. Lab., Palo Alto, Calif.), and W. C. Wells (Lockheed Palo Alto Res. Lab., Palo Alto, Calif.) May 1974 24 p refs Submitted for publication
(LFC-UL-1) Avail: NTIS HC $3.25

A Fabry-Perot tilting filter photometer, interfaced with a Dahl-Kirkham telescope, was designed for measuring methane concentration and its rotational temperature by isolating several lines in the g nu 3 bands of the comet Kohoutek infrared spectrum. This assembly was flown on board a Convair 990 research aircraft. No measurable signals of methane emission were found; however, the upper limit for methane production, several orders of magnitude less than originally predicted for a first close approach

of Kohoutek to the sun, could be calculated from the detection limit. ESRO

N75-17263# Lecce Univ. (Italy). Ist. di Fisica.
NEAR INFRARED OBSERVATIONS OF THE DUST COMA OF COMET KOHOUTEK WITH A TILTING-FILTER FABRY-PEROT PHOTOMETER
C. Barbieri (Padua Univ.), C. B. Cosmovici, K. W. Michel (Max-Planck-Inst. fuer Extraterrestrische Phys., Garching, West Ger.), T. Nishimura (Max-Planck-Inst. fuer Extraterrestrische Phys., Garching, West Ger.), and A. E. Roche (Lockheed Palo Alto Res. Lab., Palo Alto, Calif.) Jun. 1974 27 p refs Submitted for publication
(LFC-UL-2) Avail: NTIS HC $3.75

By means of narrow band Fabry-Perot filters, which exclude the interference from molecular line fluorescence, the brightness of Comet 1973 f was measured at 8560 and 8748 A. Data reduction on the basis of averaged Mie scattering cross sections indicates that the dust production rate was different before and after perihelion at the same heliocentric distances. This asymmetry suggests that vaporization and dust entrainment were governed by fractionation of a multicomponent mixture of parent molecules in a comparatively porous cometary nucleus. Author (ESRO)

N75-17244* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SHORT WAVELENGTH RADIO OBSERVATIONS OF SATURN'S RINGS
Michael A. Janssen *In* NASA, Washington The Rings of Saturn 1974 p 83-96 refs (For availability see N75-17236 08-88) CSCL 03A

N75-17245* California Inst. of Tech., Pasadena.
MICROWAVE INTERFEROMETRY OF SATURN: APPLICATION TO THE BRIGHTNESS TEMPERATURE OF THE RINGS
Glenn L. Berge *In* NASA, Washington The Rings of Saturn 1974 p 97-105 refs (For availability see N75-17236 08-88) CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-17264 British Library Lending Div., Boston Spa (England).
IN THE BOWELS OF NEUTRON STARS
E. Andronikashvili 21 May 1974 5 p Transl. into ENGLISH from Pravda (Moscow), 6 May 1974
(BLL-M-23397-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The superfluidity of liquid helium is discussed, and these properties applied to the motion of neutron stars. P.N.F.

N75-17265* National Aeronautics and Space Administration, Washington, D.C.
JOVIAN MAGNETIC FIELDS IS COMPLEX, PIONEER 11 SHOWS
Nicholas Panagakos and Peter Waller 6 Mar. 1975 10 p
(NASA-News-Release-75-49) Avail: NASA Scientific and Technical Information Facility P.O. Box 8757, B.W.I. Airport, Maryland 20740 CSCL 03B

An analysis of the magnetic field of the planet Jupiter is presented. The data are based on the information returned by Pioneer 11 space probe. It was determined that the magnetic field stretches across 9 million miles of space at some times and shrinks in volume by three-fourths or more at other times. It was also determined that electrons trapped in the magnetic field of Jupiter are 10,000 times more intense than those in the Van Allen radiation belts which circle the earth. Additional data were obtained on the polar regions, atmospheric circulation, and the nature of the moons. Author

N75-17266*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE COMPLEX MAGNETIC FIELD OF JUPITER
M. H. Acuna and N. F. Ness Feb. 1975 26 p refs Submitted for publication
(NASA-TM-X-70833; X-690-75-42) Avail: NTIS HC $3.75 CSCL 03B

An analysis of the characteristics of the magnetic field of the planet Jupiter is presented. The data were obtained during the flight of Pioneer 11 space probe, using a high field triaxial fluxgate magnetometer. The data are analyzed in terms of traditional Schmitt normalized spherical harmonic expansion fitted to the observations in a least squares sense. Tables of data and graphs are provided to summarize the findings. Author

N75-17267*# Planetary Science Inst., Tucson, Ariz.
SMALL BODIES AND THE OUTER PLANETS AND APPENDICES 1 AND 2 Final Report
D. R. Davis Aug. 1974 163 p refs
(Contract NASw-2521)
(NASA-CR-142085) Avail: NTIS HC $6.25 CSCL 03B

Correlations of asteroid spectral reflectivity characteristics with orbital parameters have been sought. Asteroid proper elements and extreme heliocentric distance were examined. Only general trends were noted, primarily red asteroids and asteroids with IR (.95 micron) absorption bands are concentrated toward the inner part of the belt. Also, asteroids with the pyroxene band tend to have larger proper eccentricities relative to non-banded asteroids. Author

N75-17268# Hiroshima Univ. (Japan). Research Inst. for Theoretical Physics.
NONLINEAR BEHAVIOR OF NONSPHERICAL PERTURBATIONS IN RELATIVISTIC GRAVITATIONAL COLLAPSE
K. Tomita Jan. 1974 24 p refs
(RRK-74-3) Avail: AEC Depository Libraries

For clarifying the final state of relativistic gravitional collapse, the behavior nonspherical perturbations in the neighborhood of the Schwarzschild surface was examined by analyzing the second-order nonlinear perturbations as well as the first-order linear ones. It was found that through the perturbations corresponding to incoming gravitational waves reflected by the potential barrier, the nonlinear effect becomes important, when the surface of the collapsing object approaches the Schwarzschild surface. This means that the conclusions about the final state derived in the linear approximation are questionable. It is concluded that however small the initial nonspherical perturbations are, full nonlinearity must be considered in order to analyze dynamical processes in the neighborhood of the final state. Author (NSA)

N75-17269# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ON THE SUPERPOSITION OF GRAVITATIONAL WAVES
J. B. Griffiths Jul. 1974 15 p refs
(MATHS-RES-44) Avail: NTIS HC $3.25

The nature of the nonlinear interaction between two gravitational waves in the general theory of relativity is considered. An exact solution of the vacuum field equations, which described the interaction of two gravitational waves with both transverse and longitudinal components, propagating in opposite directions along shearing and twisting geodetic congruences with zero contraction, is given. Author (ESRO)

N75-17237* Smithsonian Astrophysical Observatory, Cambridge, Mass.
STRUCTURE OF SATURN'S RINGS: OPTICAL AND DYNAMICAL CONSIDERATIONS
Fred A. Franklin *In* NASA, Washington The Rings of Saturn 1974 p 3-15 refs (For availability see N75-17236 08-88) CSCL 03B

N75-17238* Massachusetts Univ., Amherst.
MODEL OF SATURN'S RINGS THAT SATISFIES THE OBSERVED PHASE CURVE FOR OPTICAL SCATTERING
William M. Irvine *In* NASA, Washington The Rings of Saturn 1974 p 17-28 refs (For availability see N75-17236 08-88) CSCL 03B

N75-17239* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SATURN'S RING PARTICLES AND SPACE VEHICLE DESIGN
Frank Don Palluconi *In* NASA, Washington The Rings of Saturn

1974 p 29-38 refs (For availability see N75-17236 08-88)
CSCL 03B

N75-17241* California Univ., Los Angeles.
RING PARTICLE SIZES AND COMPOSITION DERIVED FROM ECLIPSE COOLING CURVES AND REFLECTION SPECTRA
Hugh H. Kieffer *In* NASA, Washington The Rings of Saturn 1974 p 51-63 refs (For availability see N75-17236 08-88)
CSCL 03B

N75-17242* Hawaii Univ., Honolulu.
VARIATIONS IN THE INFRARED BRIGHTNESS TEMPERATURE OF SATURN'S RINGS
Robert E. Murphy *In* NASA, Washington The Rings of Saturn 1974 p 65-72 refs (For availability see N75-17236 08-88)
CSCL 03B

N75-17243* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DISTRIBUTION AND SIZE OF ELEMENTS OF SATURN'S RINGS AS INFERRED FROM 12-cm RADAR OBSERVATIONS
George A. Morris, Jr. *In* NASA, Washington The Rings of Saturn 1974 p 73-82 refs (For availability see N75-17236 08-88)
CSCL 03B

N75-17246* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ESTIMATES OF THE SIZE OF PARTICLES IN SATURN'S RINGS AND THEIR COSMOGONIC IMPLICATIONS
James B. Pollack *In its* The Rings of Saturn 1974 p 107-123 refs (For availability see N75-17236 08-88)
CSCL 03B

N75-17247* Centre National d'Etudes Spatiales, Paris (France).
THE ATMOSPHERE OF THE RINGS OF SATURN
Jacques Blamont *In* NASA, Washington The Rings of Saturn 1974 p 125-129 refs (For availability see N75-17236 08-88)
CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-17270* National Aeronautics and Space Administration, Washington, D.C.
MARS AS VIEWED BY MARINER 9
1974 279 p
(NASA-SP-329; LC-73-600151) Avail: SOD HC $8.15 CSCL 03B

Photographs of the surface of the planet Mars which were obtained by the Mariner 9 space probe are presented. Areas of investigation during the Mariner 9 flight involved television coverage, ultraviolet spectroscopy, infrared spectroscopy, infrared radiometry, S-band occultation, and celestial mechanics. Descriptions of the photographs are provided to further identify the surface features and the coordinates of the area photographed are included. Emphasis is placed on the visual evidence of the effects of wind in shaping the Martian surface. Photographs of cloud formations and dust storms are analyzed. Author

N75-17271*# Miami Univ., Coral Gables, Fla. Inst. for Molecular and Cellular Evolution.
AMINO ACIDS PRECURSORS IN LUNAR FINDS Final Technical Report, 1 Feb. 1971 - 30 Sep. 1974
Sidney W. Fox, Kaoru Harada, P. E. Hare, Gertrude Hinsch, and George Mueller 15 Jan. 1975 26 p refs
(Grant NGR-10-007-088)
(NASA-CR-142111) Avail: NTIS HC $3.75 CSCL 03B

The consistent pattern is discussed of amino acids found in lunar dust from Apollo missions. The evidence indicates that compounds yielding amino acids were implanted into the surface of the moon by the solar wind, and the kind and amounts of amino acids found on the moon are closely similar to those found in meteorites. It is concluded that there is a common cosmochemical pattern for the moon and meteorites, and this offers evidence of a common course of cosmochemical reactions for carbon. F.O.S.

N75-17272*# Scientific Translation Service, Santa Barbara, Calif.
SOVIET AUTOMATIC INTERPLANETARY STATIONS INVESTIGATE MARS
S. S. Sokolov Washington NASA Feb. 1975 32 p Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (USSR), no. 10, Oct. 1974 p 21-38
(Contract NASw-2483)
(NASA-TT-F-16152) Avail: NTIS HC $3.75 CSCL 22C

Soviet experiments with automatic martian stations and planetary probes, are discussed. The ballistic peculiarities of each flight are considered, and the respective design specifications of each probe are reviewed. The separate systems of equipment described are: the system of thermal control of the probe interior, the radio-phototelemetric complex, the attitude system and its control, the system of autonomous control, the power supply system, the system of overall automatics, and the system of engines to produce correcting and braking pulses. Details are discussed concerning the descent of planetary probes to the Mars surface, and the ground command-measurement complex for reception and processing of the telemetric and phototelevision information, for measure of motion parameters, and for organization of control of spacecraft in flight. Scientific instrumentation of the probe is also discussed, and preliminary results are presented. Author

N75-17273*# Idaho Univ., Moscow.
GEOLOGY OF THE SKLODOWSKA REGION, LUNAR FARSIDE M.S. Thesis Final Report
John David Kauffman Nov. 1974 177 p refs
(Grant NGR-13-001-014)
(NASA-CR-142150) Avail: NTIS HC $7.00 CSCL 03B

Investigation of an area on the lunar farside has resulted in a geologic map, development of a regional stratigraphic sequence, and interpretation of surface materials. Apollo 15 metric photographs were used in conjunction with photogrammetric techniques to produce a base map to which geologic units were later added. Geologic units were first delineated on the metric photographs and then transferred to the base map. Materials were defined and described from selected Lunar Orbiter and Apollo 15 metric, panoramic, and Hasselblad photographs on the basis of distinctive morphologic characteristics. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-17274*# Washington Data Processing, Inc., Riverdale, Md.
SOLAR RADIO CONTINUUM STORMS
Dec. 1974 57 p refs
(Contract NAS5-20739)
(NASA-CR-139176) Avail: NTIS HC $4.25 CSCL 03B

Radio noise continuum emission observed in metric and decametric wave frequencies is discussed. The radio noise is associated with actively varying sunspot groups accompanied by the S-component of microwave radio emissions. It is shown that the S-component emission in microwave frequencies generally occurs several days before the emission of the noise continuum storms of lower frequencies. It is likely that energetic electrons, 10 to 100 Kev, accelerated in association with the variation of sunspot magnetic fields, are the sources of the radio emissions. A model is considered to explain the relation of burst storms on radio noise. An analysis of the role of energetic electrons on the emissions of both noise continuum and type III burst storms is presented. It is shown that instabilities associated with the electrons and their relation to their own stabilizing effects are important in interpreting both of these storms. Author

N75-17275*# Washington Data Processing, Inc., Riverdale, Md.
SOLAR RADIO CONTINUUM STORMS AND A BREATHING MAGNETIC FIELD MODEL Final Report
Jan. 1975 51 p refs
(Contract NAS5-20739)
(NASA-CR-139178) Avail: NTIS HC $4.25 CSCL 03B

Radio noise continuum emissions observed in metric and decametric wave frequencies are, in general, associated with actively varying sunspot groups accompanied by the S-component of microwave radio emissions. These continuum emission sources, often called type I storm sources, are often associated with type III burst storm activity from metric to hectometric wave frequencies. This storm activity is, therefore, closely connected with the development of these continuum emission sources. It is shown that the S-component emission in microwave frequencies generally precedes, by several days, the emission of these noise continuum storms of lower frequencies. In order for these storms to develop, the growth of sunspot groups into complex types is very important in addition to the increase of the average magnetic field intensity and area of these groups. After giving a review on the theory of these noise continuum storm emissions, a model is briefly considered to explain the relation of the emissions to the storms. Author

N75-17276*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MARINER VENUS/MERCURY 1973 SOLAR RADIATION FORCE AND TORQUES
R. M. Georgevic 1 Dec. 1974 162 p refs
(Contract NAS7-100)
(NASA-CR-142092; JPL-TM-33-698) Avail: NTIS HC $6.25 CSCL 03B

The need for an improvement of the mathematical model of the solar radiation force and torques for the Mariner Venus/Mercury spacecraft arises from the fact that this spacecraft will be steering toward the inner planets (Venus and Mercury), where, due to the proximity of the Sun, the effect of the solar radiation pressure is much larger than it was on the antecedent Mariner spacecraft, steering in the opposite direction. Therefore, although the model yielded excellent results in the case of the Mariner 9 Mars Orbiter, additional effects of negligible magnitudes for the previous missions of the Mariner spacecraft should now be included in the model. This study examines all such effects and incorporates them into the already existing model, as well as using the improved model for calculation of the solar radiation force and torques acting on the Mariner Venus/Mercury spacecraft. Author

N75-17277*# California Inst. of Tech., Pasadena.
ANALYSIS OF OGO-5 AND OSO-7 X-RAY DATA Final Report
Ronald L. Moore Feb. 1975 8 p refs
(Grant NGR-05-002-294)
(NASA-CR-142131) Avail: NTIS HC $3.25 CSCL 03B

The physical nature of solar flares implied by the data was studied. The empirical results were obtained primarily from the OGO-5 and OSO-7 X-ray data in combination with optical data. The principal conclusions regarding the physics of flares are the following. (1) Flares are produced by magnetic field reconnection. (2) The resulting thermal X-ray plasma is cooled primarily by heat conduction rather than by radiative cooling. (3) The heating and cooling of the thermal X-ray plasma are approximately in balance during the maximum phase of the flare. Author

N75-17278*# California Inst. of Tech., Pasadena.
X-RAY BURSTS FROM SOLAR FLARES BEHIND THE LIMB
J. Rene Roy and Dayton W. Datlowe [1975] 54 p refs
(Contract NAS5-11081; Grant NGR-05-002-294; Contract F19628-73-C-0085)
(NASA-CR-142132; BBSO-0143) Avail: NTIS HC $4.25 CSCL 03B

X-ray bursts are identified from the UCSD OSO-7 X-ray experiment data. X-ray spectroheliograms of OSO-5, H alpha activity at the limb, and the emergence and disappearance of sunspot groups at the limb were studied and 17 active centers were found as likely seats of the X-ray bursts beyond the limb. The analysis of 37 X-ray bursts and their physical parameters is presented. Results show that (1) the distributions of maximum temperature, maximum emission measure, and characteristic cooling time of the over-the-limb events do not significantly differ from those of disk events; (2) that radiation is the dominant cooling mechanism for the hot flare plasma; and (3) that the scale height for X-ray emission in the 5-10 keV range is large. Observations show that the fraction of soft X-ray bursts which have a nonthermal component is the same on and off of the disk. Hard X-ray emission over extended regions is indicated. Author

N75-17279# California Univ., Berkeley. Lawrence Berkeley Lab.
COMPARISON OF COMPUTER PROGRAMS USED FOR MODELING SOLAR HEATING AND AIR CONDITIONING SYSTEMS FOR BUILDINGS
R. M. Graven Jun. 1974 21 p refs Presented at the Intern. Solar energy Soc., Fort Collins, Colorado, 19 Aug. 1974
(Contract W-7405-eng-48)
(LBL-3066; Conf-740811-1) Avail: NTIS HC $3.25

A comparison of the major architectural structure of computer programs available to aid in the design of solar heating and cooling systems for buildings is presented. A brief description of each program including the size, availability, inputs required, and the flow of information through the program is outlined. The equipment required to run the programs and the costs of obtaining and running the programs is summarized. The pertinent details required to select a computer program for educational or commercial applications are summarized. Author (NSA)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-17280*# Scientific Translation Service, Santa Barbara, Calif.
NUCLEAR REACTIONS IN COSMIC BODIES
A. K. Lavrukhina Washington NASA Feb. 1975 432 p refs Transl. into ENGLISH of the book "Yadernyye Reaktsii v Kosmicheskikh Telakh" Moscow, Nauka Press, 1972 p 1-250
(Contract NASw-2483)
(NASA-TT-F-802) Avail: NTIS HC $11.25 CSCL 03B

The simulation of nuclear reactions caused by cosmic rays in meteorites and the surface layers of the moon and asteroids is discussed. Calculations are made of the depth distribution of nuclear-active particles and cosmogenic isotopes in meteorites of various sizes and compositions. It is shown that nuclear reactions are the cause of the observed anomalies in the isotopic composition of elements in meteorites when compared to the composition found in Earth rocks. Author

N75-17281*# California Inst. of Tech., Pasadena. Big Bear Solar Observatory.
SLOW X-RAY BURSTS AND CHROMOSPHERIC FLARES WITH FILAMENT DISRUPTION
J. Rene Roy and Frances Tang [1975] 31 p refs
(Grant NGR-05-002-294)
(NASA-CR-142151; BBSO-0141) Avail: NTIS HC $3.75 CSCL 03B

The data from OGO-5 and OSO-7 X-ray experiments have been analyzed to study six chromospheric flares with filament disruption associated with slow thermal X-ray bursts. Filament activation accompanied by a slight X-ray enhancement precedes the first evidence of H alpha flare by a few minutes. Rapid increase of the soft X-ray flux is accompanied by a sudden brightening of the filament when viewed on-band H alpha. Thereafter the bright chromospheric strands reach their maximum brightness with maximum X-ray flux. Any plateau or slow decay phase in the X-ray flux is accompanied by a quieting in filament activity and even by filament re-appearance. The height of the disrupted prominence is proportional to the soft X-ray flux for the August 3, 1970 limb occulted event. Author

N75-17282# Manchester Univ. (England).
JODRELL BANK ANNALS, SERIES 1, VOLUMES 2, PART 2
Aug. 1974 209 p refs Reprinted
Avail: NTIS HC $7.25

A survey of linear polarization of galactic background radiation is presented along with observations of the angular structure of quasars. For individual titles, see N75-17283 through N75-17284.

N75-17283 Manchester Univ. (England).
THE LINEAR POLARIZATION OF PART OF THE NORTHERN SKY AT 49 cm WAVELENGTH, 2
J. R. Baker and A. Wilkinson *In its* Jodrell Bank Ann., Ser. 1, Vol. 2, Pt. 2, 1974 Aug. 1974 p 84-249 refs (For availability see N75-17282 08-93)

The results of a survey of the linear polarization of the galactic background radiation are presented, at both 0.75 and 1.3 resolution. The survey covered the area 23h < alpha (1950.0) < 08h, 20 deg < delta (1950) < 90 deg with a beamwidth of 0.6 arc, and a sensitivity of approximately 0.2K in polarized brightness temperature. Full details were published previously. Brief notes on the details of the survey, the temperature scale and the accuracy of the survey are included. Author

N75-17284 Manchester Univ. (England).
OBSERVATIONS OF RADIO SOURCES WITH AN INTERFEROMETER OF 24 km BASELINE. 4: THE ANGULAR STRUCTURES AT 408 AND 610 MHz OF 30 QUASARS WITH STEEP RADIO SPECTRA AND FIVE OTHER RADIO SOURCES
D. N. Wilkinson, P. J. Richards, and T. N. Bowden *In its* Jodrell Bank Ann., Ser. 1, Vol. 2, Pt. 2, 1974 Aug. 1974 p 250-292 refs (For availability see N75-17282 08-93)

The observational data, in the form of fringe visibility curves are presented together with the computed visibility functions of the optimum models for 30 steep spectrum quasars. These observations, made with the MK I-MK III interferometer at Jodrell Bank, were discussed in detail elsewhere. The results and a brief discussion are included on five other sources which were studied during the same observing session. Author

99 GENERAL

N75-17285*+ National Aeronautics and Space Administration, Washington, D.C.
INDEX TO NASA TECH BRIEFS, 1973
Feb. 1974 115 p
(NASA-SP-5021(14)) Avail: NTIS HC $5.25 CSCL 05B

Short announcements of technology derived from the research and development activities of NASA or the U.S. Atomic Energy Commission are issued to encourage commercial application. Emphasis is placed on information considered likely to be transferrable across industrial, regional, or disciplinary lines. Abstracts and indexes are given. Author

N75-17286# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 339
27 Dec. 1974 56 p Transl. into ENGLISH from Russian articles
(JPRS-63750) Avail: NTIS HC $4.25

Materials gathered from recent publications of the Sino-Soviet countries are presented in the form of abstracts, summaries, and occasional full text translations. Complete bibliographic information accompanies each article. The following subjects are covered: astronomy, meteorology, oceanography, upper atmosphere and space research, and terrestrial geophysics. Author

N75-17287# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 447
31 Dec. 1974 26 p Transl. into ENGLISH from several East European articles
(JPRS-63772) Avail: NTIS HC $3.75

Development and progress in various theoretical and applied scientific disciplines and technical fields is described. The administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences are presented. For individual titles, see N75-17288 through N75-17289.

N75-17288 Joint Publications Research Service, Arlington, Va.
SCIENTIFIC ACHIEVEMENTS INTRODUCED IN PRACTICE c09
Kiril B. Serafimov, Nikolay Naplatanov, Vasil Sgurev, Petur Petrov, Zdravko Nikolov, and Aleksandur Ganchev *In its* Transl. on Eastern Europe (JPRS-63772) 31 Dec. 1974 p 1-7 Transl. into ENGLISH from Spisanie Bulgar. Akad. Nauk (Sofia), no. 3, 1974 p 83-91 (For availability see N75-17287 08-99)

Development and progress in natural, mathematical, and technical sciences is summarized. The following main achievements are briefly discussed: (1) a FOR-32 translator; (2) technology for the passivation of silicon dioxide semiconductor instruments, applied with continuous current reactive cathode powdering; (3) noncyanic alkaline zinc plating; (4) water protection screen; and (5) battery production technology. A detailed description of an automated system for operation motor vehicle transportation control (Astra-71) is included. The development and application of the Astra-71 system broadens the possibilities for the use of automated control systems with a broad spectrum of highly reliable technical facilities. J.M.S.

N75-17289 Joint Publications Research Service, Arlington, Va.
VIDEOTON COMPUTER TECHNOLOGY FACTORY PRODUCTION c60
Mihaly Papai *In its* Transl. on Eastern Europe (JPRS-63772) 31 Dec. 1974 p 8-22 Transl. into ENGLISH from Finommechanika-Mikrotechnika (Hungary), v. 13, 1974 p 289-294 (For availability see N75-17287 08-99)

The development of peripheral equipment containing the basic and supplementary periphery of the ESZ 1010 small computer is described. Emphasis is placed on the development of the following peripheral equipment: (1) type 42 110 punched card reader (CR 600); (2) types 44 100 and 44 101 fast tape perforator (PM 150 and PM 150 R); and (3) types 24 110 and 25 110 line printer. The quality of ESZ 1010 and 1010 BM computer configuration is improved by the periphery equipment. J.M.S.

N75-17290# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
[RESEARCH ACTIVITIES OF THE INSTITUTES OF THE GERMAN AVIATION AND SPACE RESEARCH ESTABLISHMENT] Annual Report, 1973 [DFVLR JAHRESBERICHT 1973]
Jun. 1974 417 p refs In GERMAN
Avail: NTIS HC $10.50

The 1973 annual report of the Institutes of the German Aviation and Space Research is presented. Activities in the following fields are described: fluid mechanics, flight mechanics and flight control, materials and structures, propulsion systems, electronics, atmospheric physics, space environment simulation, and flight medicine. ESRO

N75-17291# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
AEROSPACE ACTIVITIES Annual Report, 1973
1973 163 p
Avail: NTIS HC $6.25

The 1973 annual report on activities at ONERA are presented. Data cover the fields of: aerodynamics, large wind tunnels, structural engineering, aircraft and spacecraft propulsion, physics, and materials. ESRO

N75-17292# European Space Research Organization, Paris (France).
THE EFFECT OF AN ADDITIONAL HEIGHT MEASUREMENT ON THREE-DIMENSIONAL POSITION FIXING USING LOW ORBITING NAVIGATION SATELLITES

Helge Haensel, Otto Weber et al Oct. 1974 55 p refs Transl. into ENGLISH of Der Einfluss einer zusaetzlichen Hoehenmessung auf dreidimensionale Standortbestimmungen mit Hilfe umlaufender Navigationssatelliten, DLR-FB-73-28, DFVLR, 1973 (ESRO-TT-99; DLR-FB-73-28) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 13.50 DM

The use of satellites of the Navy Navigation Satellite System, for three dimensional position fixing and the accuracy improvement which will be obtained by the additional measurement of the height of the receiving antenna with respect to the north ellipsoid, is described. The equations for the displacement of the position and for the improvement of the error ellipsoid are derived as a function of the following data: the parameters of the original Doppler system, the standard deviation, and the value of the additional height measurement. The effect of the latter on actual Doppler measurements at Brunswick is demonstrated for two particularly unfavorable satellite passes and for a sample of 33 passes. The statistical methods described are also applicable to other navigation systems. Author (ESRO)

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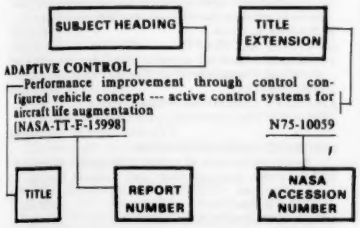

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7040).

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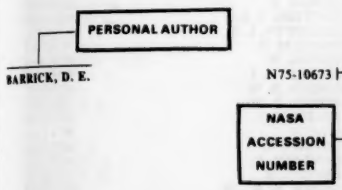

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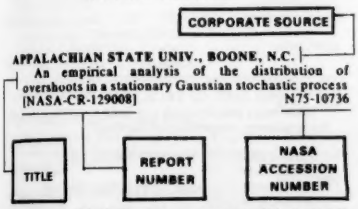

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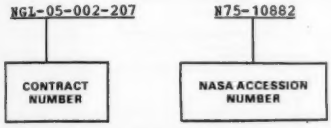

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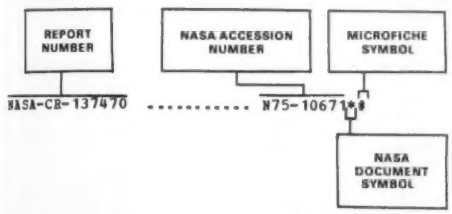

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AD-777889 ..... N75-16530 #
AD-779336 ..... N75-16531 #
AD-779353 ..... N75-17087 #
AD-781319 ..... N75-16743 #
AD-781326 ..... N75-16529 #
AD-781357 ..... N75-16568 #
AD-781795 ..... N75-16556 #
AD-781796 ..... N75-16698 #
AD-781797 ..... N75-16565 #
AD-781798 ..... N75-16742 #
AD-781857 ..... N75-16744 #
AD-783185 ..... N75-16880 #
AD-783186 ..... N75-17225 #
AD-783190 ..... N75-16567 #
AD-783633 ..... N75-16697 #
AD-783749 ..... N75-16545 #
AD-783751 ..... N75-16564 #
AD-784980 ..... N75-16690 #
AD-785858 ..... N75-16720 #
AD-785859 ..... N75-16566 #
AD-785963 ..... N75-16677 #
AD-786553 ..... N75-16577 #
AD-786812 ..... N75-17181 #
AD-787377 ..... N75-17090 #
AD-787533 ..... N75-16710 #
AD-787617 ..... N75-16682 #
AD-787664 ..... N75-16689 #
AD-787719 ..... N75-16874
AD-787722 ..... N75-16875
AD-787839 ..... N75-17157 #

AED-R-4045 ..... N75-16809*#

AERE-BIB-151B ..... N75-16665 #

AERE-R-7744 ..... N75-16684 #

AGARD-AG-195 ..... N75-16828 #
AGARD-AG-196 ..... N75-17079 #
AGARD-AG-198 ..... N75-17229 #

AGARDOGRAPH-195 ..... N75-16828 #
AGARDOGRAPH-196 ..... N75-17079 #

AIDJEX-74-26 ..... N75-16944 #

ANABE-TN-10 ..... N75-17026 #

ANCR-1155 ..... N75-16985 #
ANCR-1156 ..... N75-17126 #

ANL-8058 ..... N75-16990 #
ANL-8064 ..... N75-16984 #

ANL/ES-36 ..... N75-17230 #

ARB-R-2-372-74-25 ..... N75-17089 #
ARB-R-2-1330-73-17 ..... N75-17019 #

ARC-CP-1270 ..... N75-16552 #
ARC-CP-1275 ..... N75-16526 #
ARC-CP-1278 ..... N75-17096 #
ARC-CP-1286 ..... N75-16527 #
ARC-CP-1292 ..... N75-16520 #
ARC-CP-1294 ..... N75-16780 #

ARC-R/M-3738 ..... N75-16553 #
ARC-R/M-3745 ..... N75-16521 #
ARC-R/M-3747 ..... N75-16522 #

ARC-31312 ..... N75-16520 #
ARC-33488 ..... N75-16522 #
ARC-33863 ..... N75-16521 #
ARC-33992 ..... N75-16553 #
ARC-34095 ..... N75-16521 #
ARC-34179 ..... N75-17096 #
ARC-34296 ..... N75-16552 #
ARC-34362 ..... N75-16526 #
ARC-34641 ..... N75-16527 #
ARC-34951 ..... N75-16780 #

ARL-73-13/FAA-73-2 ..... N75-16530 #

ARL/ME-NOTE-346 ..... N75-16558 #
ARL/SM-NOTE-349 ..... N75-16661 #
ARL/SM-NOTE-408 ..... N75-16549 #
ARL/SM-NOTE-409 ..... N75-16550 #

AS-PAPER-228 ..... N75-17051 #

ATR-74(7349)-1 ..... N75-16584*#

AU8-26193-FRI-PT-1 ..... N75-16749*#
AU8-26193-FRI-PT-2 ..... N75-16750*#

A74-36852 ..... N75-16514*#

B-164105 ..... N75-16975 #
B-179166 ..... N75-17226 #

BBC-RD-1974/42 ..... N75-16692

BBSO-0141 ..... N75-17281*#
BBSO-0143 ..... N75-17278*#

BDX-613-REV ..... N75-16869 #
BDX-613-1056-REV ..... N75-16858 #
BDX-613-1076-REV ..... N75-16870 #
BDX-613-1083-REV ..... N75-16859 #
BDX-613-1105-REV ..... N75-16860 #
BDX-613-1122-REV ..... N75-16757 #
BDX-613-1150-REV ..... N75-16822 #
BDX-613-1167-REV ..... N75-17180 #

BLL-CE-TRANS-6134-(9022.09) N75-16628
BLL-CE-TRANS-6185-(9022.09) N75-16506
BLL-CE-TRANS-6195-(9022.09) N75-16762
BLL-CE-TRANS-6200-(9022.09) N75-16640
BLL-CE-TRANS-6215-(9022.09) N75-16641
BLL-CE-TRANS-6216-(9022.09) N75-16631
BLL-CE-TRANS-6229-(9022.09) N75-16846
BLL-CE-TRANS-6246-(9022.09) N75-16656
BLL-CE-TRANS-6247-(9022.09) N75-16847

BLL-CE-TRANS-6274-(9022.09) N75-16713
BLL-CE-TRANS-6296-(9022.09) N75-16848
BLL-CE-TRANS-6335-(9022.09) N75-16711
BLL-CE-TRANS-6336-(9022.09) N75-17182
BLL-CE-TRANS-6341-(9022.09) N75-16657
BLL-CE-TRANS-6342-(9022.09) N75-16655

BLL-M-23286-(5828.4F) N75-16671
BLL-M-23290-(5828.4F) N75-16902
BLL-M-23294-(5828.4F) N75-17035
BLL-M-23397-(5828.4F) N75-17264
BLL-M-23401-(5828.4F) N75-17039
BLL-M-23402-(5828.4F) N75-17040
BLL-M-23462-(5828.4F) N75-17036
BLL-M-23463-(5828.4F) N75-17037
BLL-M-23464-(5828.4F) N75-17038
BLL-M-23465-(5828.4F) N75-16903
BLL-M-23466-(5828.4F) N75-17056
BLL-M-23499-(5828.4F) N75-16947
BLL-M-23506-(5828.4F) N75-16578
BLL-M-23508-(5828.4F) N75-16969
BLL-M-23509-(5828.4F) N75-17009
BLL-M-23512-(5828.4F) N75-16946
BLL-M-23516-(5828.4F) N75-16968
BLL-M-23519-(5828.4F) N75-16945
BLL-M-23595-(5828.4F) N75-17010
BLL-M-25019-(5828.4F) N75-16659
BLL-M-25021-(5828.4F) N75-17183
BLL-M-25034-(5828.4F) N75-16683
BLL-M-25035-(5828.4F) N75-16633

BLL-NEL-TT-2454-(6075.461) N75-17133
BLL-NEL-TT-2501-(6075.461) N75-16763
BLL-NEL-TT-2510-(6075.461) N75-16871

BLL-OA-TRANS-1250-(6196.3) N75-16712

BLL-RTS-8873 ..... N75-16632

BLL-TRANS-2943-(9022.81) N75-16967
BLL-TRANS-2991-(9022.81) N75-16715
BLL-TRANS-3008-(9022.81) N75-16718
BLL-TRANS-3041-(9022.81) ..... N75-16714 *
BLL-TRANS-3120-(9022.81) N75-16694
BLL-TRANS-3142-(9022.81) N75-17116
BLL-TRANS-3144-(9022.81) N75-17117
BLL-TRANS-3157-(9022.81) N75-16672
BLL-TRANS-3174-(9022.81) N75-16693

BLL-WH-TRANS-352-(9091.9F) N75-16784

BM-IC-8647 ..... N75-17004 #

BM-RI-7954 ..... N75-16965*#

BMFT-FB-T-74-27 ..... N75-16759 #
BMFT-FB-T-74-28 ..... N75-16760 #

BNL-19133 ..... N75-16754 #

BNWL-SA-4941 ..... N75-17014 #

BNWL-1850-PT-3 ..... N75-17029 #
BNWL-1856 ..... N75-17167 #

BR29243 ..... N75-17231 #
BR38821 ..... N75-16618 #
BR39686 ..... N75-16572 #
BR39888 ..... N75-16653 #
BR40617 ..... N75-16607 #
BR40764 ..... N75-16758 #
BR41164 ..... N75-16680 #
BR41301 ..... N75-16704 #
BR41610 ..... N75-16627 #
BR41646 ..... N75-16673 #
BR41806 ..... N75-16703 #
BR42183 ..... N75-17131 #
BR42278 ..... N75-16688 #

CASD-NAS74-008 ..... N75-16634*#

CEA-CONF-2596 ..... N75-16882 #

CEA-R-4302 ..... N75-16784
CEA-R-4596 ..... N75-17186 #
CEA-R-4612 ..... N75-16816 #

CISE-N-167 ..... N75-17141 #

CLM-R-138 ..... N75-16815 #

CONF-730907-P2 ..... N75-17164 #
CONF-740128-1 ..... N75-16882 #
CONF-740555-1 ..... N75-16995 #
CONF-740606-20 ..... N75-16663 #
CONF-740725-1 ..... N75-17156 #
CONF-740805-4 ..... N75-16989 #
CONF-740805-5 ..... N75-16988 #
CONF-740809-4 ..... N75-16812 #
CONF-740809-9 ..... N75-16866 #
CONF-740811-1 ..... N75-17279 #
CONF-740837-2 ..... N75-16777 #
CONF-740838-1 ..... N75-16817 #
CONF-740906-1 ..... N75-16867 #
CONF-740908-1 ..... N75-16994 #
CONF-740921-2 ..... N75-17017 #
CONF-740922-8 ..... N75-17014 #
CONF-740931-2 ..... N75-16810 #
CONF-740936-1 ..... N75-16754 #
CONF-740942-1 ..... N75-17027 #
CONF-741001-4 ..... N75-17129 #
CONF-741001-5 ..... N75-17135 #
CONF-741001-7 ..... N75-17127 #
CONF-741001-8 ..... N75-17113 #
CONF-741001-10 ..... N75-16685 #
CONF-741008-2 ..... N75-16752 #
CONF-741008-3 ..... N75-16691 #
CONF-741018 ..... N75-17088 #
CONF-741020-1 ..... N75-16819 #
CONF-741021-1 ..... N75-16755 #
CONF-741029-1 ..... N75-16885 #

COO-1105-210 ..... N75-17170 #
COO-2009-57A ..... N75-17162 #
COO-2128-8 ..... N75-17166 #
COO-2185-6 ..... N75-17054 #

CRC-1237 ..... N75-16741 #

CRIP-MT-95 ..... N75-16668 #

DESY-74/35 ..... N75-17140 #

DLR-FB-73-16 ..... N75-16525 #
DLR-FB-73-28 ..... N75-17292 #
DLR-FB-73-62 ..... N75-16886 #
DLR-FB-73-66 ..... N75-16505 #
DLR-FB-73-67 ..... N75-16592 #
DLR-FB-73-70 ..... N75-16614 #
DLR-FB-74-18 ..... N75-16532 #

DLR-MITT-67-22 ..... N75-16508*#
DLR-MITT-74-08 ..... N75-16524 #

DNA-3351F ..... N75-16682 #

DOT-TSC-OST-73-2 ..... N75-16576 #
DOT-TSC-OST-73-16A-VOL-2 ..... N75-17233 #
DOT-TSC-OST-73-16A-VOL-3 ..... N75-17234 #
DOT-TSC-OST-73-16A-VOL-3A ..... N75-17235 #
DOT-TSC-OST-74-14-2A ..... N75-16533 #
DOT-TSC-OST-74-14-2B ..... N75-16534 #
DOT-TSC-OST-74-14-2C ..... N75-16535 #
DOT-TSC-OST-74-14-2D ..... N75-16536 #
DOT-TSC-OST-74-14-3 ..... N75-16537 #
DOT-TSC-OST-74-14-4A ..... N75-16538 #
DOT-TSC-OST-74-14-4B ..... N75-16539 #
DOT-TSC-OST-74-14-5A ..... N75-16540 #
DOT-TSC-OST-74-14-5B ..... N75-16541 #

DRB-TELS-17 ..... N75-16741 #

DREV-TN-2119/74 ..... N75-17169 #

DRU-RR-2 ..... N75-16642 #

DSIS-TM-3/74(ODG) ..... N75-17228 #

DT/SAS-108/73-SP/JM ..... N75-16998 #
DT/SAS-269/73 ..... N75-16999 #

E-8043 ..... N75-17012*#
E-8084 ..... N75-16645*#
E-8182 ..... N75-16509*#

EER-5-16 ..... N75-16565 #

EPA-650/2-74-031-B-VOL-2 ..... N75-16826 #

EQ-74-49 ..... N75-17230 #

ER-267-VOL-1 ..... N75-16598*#

ERDE-TN-95 ..... N75-16673 #
ERDE-TN-99 ..... N75-16688 #

ERIM-102300-15-L ..... N75-16956*#
ERIM-196200-7-T ..... N75-16963 #

ESL-3892-1 ..... N75-17150*#

ESRO-CR(P)-325 ..... N75-16998 #
ESRO-CR(P)-328 ..... N75-16999 #
ESRO-CR(P)-433 ..... N75-16861 #
ESRO-CR(P)-477 ..... N75-16895 #
ESRO-CR(P)-539 ..... N75-16896 #
ESRO-CR(P)-549 ..... N75-16864 #
ESRO-CR(P)-555-VOL-2 ..... N75-16615 #
ESRO-CR(P)-557 ..... N75-16706 #
ESRO-CR(P)-558 ..... N75-16604 #
ESRO-CR(P)-561 ..... N75-16707 #
ESRO-CR(P)-562 ..... N75-16616 #
ESRO-CR(P)-563 ..... N75-16825 #
ESRO-CR(P)-564 ..... N75-17001 #
ESRO-CR(P)-565 ..... N75-17115 #

ESRO-CR-214 ..... N75-16865 #
ESRO-CR-215 ..... N75-17002 #
ESRO-CR-471 ..... N75-16617 #

ESRO-ESTL-9 ..... N75-17001 #

ESRO-SR-21-ESOC ..... N75-16593 #

ESRO-TT-97 ..... N75-16523 #
ESRO-TT-98 ..... N75-16897 #
ESRO-TT-99 ..... N75-17292 #
ESRO-TT-100 ..... N75-16524 #
ESRO-TT-101 ..... N75-16505 #
ESRO-TT-102 ..... N75-16592 #
ESRO-TT-105 ..... N75-16886 #
ESRO-TT-106 ..... N75-16614 #
ESRO-TT-109 ..... N75-16898 #
ESRO-TT-111-PT-1 ..... N75-16525 #
ESRO-TT-114 ..... N75-16532 #

EUR-CEA-FC-729 ..... N75-17175 #

E75-10129 ..... N75-16948*#
E75-10130 ..... N75-16949*#
E75-10131 ..... N75-16950*#
E75-10132 ..... N75-16951*#
E75-10133 ..... N75-16952*#
E75-10134 ..... N75-16953*#
E75-10135 ..... N75-16954*#
E75-10136 ..... N75-16955*#
E75-10137 ..... N75-16956*#

FAA-AM-73-14 ..... N75-17094 #
FAA-AM-73-21 ..... N75-17095 #
FAA-AM-74-1 ..... N75-17087 #

FAA-ED-00-B ..... N75-17225 #

FAA-EM-74-9 ..... N75-16531 #

FAA-NA-73-98 ..... N75-16545 #
FAA-NA-73-113 ..... N75-16571 #
FAA-NA-74-5 ..... N75-16570 #
FAA-NA-74-7 ..... N75-16556 #
FAA-NA-74-13 ..... N75-16697 #
FAA-NA-74-33 ..... N75-16564 #

FAA-RD-73-169 ..... N75-16567 #
FAA-RD-73-187-1-VOL-1 ..... N75-16880 #
FAA-RD-73-202 ..... N75-16530 #
FAA-RD-74-19 ..... N75-16556 #
FAA-RD-74-53 ..... N75-16698 #
FAA-RD-74-58 ..... N75-16570 #
FAA-RD-74-66 ..... N75-16571 #
FAA-RD-74-85 ..... N75-16529 #
FAA-RD-74-89 ..... N75-16565 #
FAA-RD-74-92 ..... N75-16568 #
FAA-RD-74-96 ..... N75-16545 #
FAA-RD-74-104 ..... N75-16743 #
FAA-RD-74-109 ..... N75-16742 #
FAA-RD-74-111 ..... N75-16744 #
FAA-RD-74-115 ..... N75-16697 #
FAA-RD-74-131 ..... N75-16566 #
FAA-RD-74-133 ..... N75-16564 #
FAA-RD-74-147 ..... N75-16720 #

FFA-TN-AU-876 ..... N75-16516 #

FHWA-RD-74-10 ..... N75-16963 #

FOK-R-1707-PT-1 ..... N75-16639 #

FOK-RV-75-56 ..... N75-16896 #

FR-1185-101 ..... N75-17098*#

FSIC-HT-23-748-74 ..... N75-17181 #
FSTC-HT-23-0292-74 ..... N75-16677 #

G-7443 ..... N75-17043*#

GH-5 ..... N75-17048 #

GPO-31-787 ..... N75-17255 #
GPO-31-891 ..... N75-16973 #

H-805 ..... N75-16560*#

HEDL-TME-74-39 ..... N75-16666 #

IB-152-74/20 ..... N75-16895 #

ICP-1054 ..... N75-16651 #

ICT-2/73 ..... N75-16629 #
ICT-3/73 ..... N75-16667 #
ICT-7/73 ..... N75-16678 #
ICT-8/73 ..... N75-16630 #
ICT-14/73 ..... N75-16679 #

IFD-2/74-PT-2 ..... N75-16517 #
IFD-5/73 ..... N75-16518 #

IFKM-WB-1/74 ..... N75-16893 #
IFKM-WB-2/74 ..... N75-16676 #
IFKM-WB-3/74 ..... N75-16894 #

INS-TL-124 ..... N75-16753 #

IP2-1/146 ..... N75-16814 #

IRL-16-1974 ..... N75-17136 #

IS-T-643 ..... N75-16820 #

ISD-147 ..... N75-16889 #
ISD-151 ..... N75-16890 #
ISD-158 ..... N75-16891 #

ISL-10/74 ..... N75-16845 #

ISVR-TR-63 ..... N75-16887 #
ISVR-TR-64 ..... N75-16892 #
ISVR-TR-65 ..... N75-17152 #
ISVR-TR-66 ..... N75-16823 #
ISVR-TR-67 ..... N75-16888 #

JPL-PR-42-25 ..... N75-16696*#

JPL-TM-33-692 ..... N75-16737*#
JPL-TM-33-698 ..... N75-17276*#
JPL-TM-33-704 ..... N75-16544*#
JPL-TM-33-714 ..... N75-16620*#
JPL-TM-33-716 ..... N75-16736*#
JPL-TM-33-717 ..... N75-17100*#
JPL-TM-33-721 ..... N75-17099*#

JPL-113 ..... N75-16904*#

JPRS-63748 ..... N75-16922 #
JPRS-63750 ..... N75-17286 #
JPRS-63757 ..... N75-16797 #
JPRS-63758 ..... N75-17013 #
JPRS-63767 ..... N75-17025 #
JPRS-63772 ..... N75-17287 #
JPRS-63789 ..... N75-17103 #
JPRS-63804 ..... N75-17161 #
JPRS-63817 ..... N75-16921 #

JPRS-63824 ..... N75-16803 #
JPRS-63927 ..... N75-16942 #

JSC-09285-REV-A ..... N75-16700*#
JSC-09293 ..... N75-17080*#
JSC-09360 ..... N75-16801*#

JTN-07 ..... N75-17119*#
JTN-09-VOL-1 ..... N75-17120*#
JTN-09-VOL-2 ..... N75-17121*#
JTN-10-VOL-1 ..... N75-17122*#
JTN-10-VOL-2 ..... N75-17123*#
JTN-11 ..... N75-17118*#

KAPL-M-7386 ..... N75-17128 #

KFK-1958 ..... N75-16775 #
KFK-1975-UF ..... N75-17015 #
KFK-2031 ..... N75-16868 #

KFKI-74-21 ..... N75-17179 #
KFKI-74-61 ..... N75-16844 #

KWMI-V-259 ..... N75-16575 #

KWMI-WR-74-14 ..... N75-17049 #

L-9712 ..... N75-16504*#
L-9763 ..... N75-16772*#
L-9766 ..... N75-17124*#
L-9803 ..... N75-16590*#
L-9878 ..... N75-16569*#

LA-UR-74-1523 ..... N75-16685 #
LA-UR-74-1578 ..... N75-17113 #
LA-UR-74-1582 ..... N75-17127 #

LA-5479 ..... N75-16778 #
LA-5596 ..... N75-16774 #
LA-5611-MS ..... N75-17174 #
LA-5689-MS ..... N75-16962 #

LAS-FAU-ELEC-1 ..... N75-17172 #

LBL-3066 ..... N75-17279 #

LC-73-600151 ..... N75-17270*

LEC-3649 ..... N75-16700*#
LEC-5265 ..... N75-16958*#

LPC-UL-1 ..... N75-17262 #
LPC-UL-2 ..... N75-17263 #

LMSC-D430482 ..... N75-17258*#
LMSC-D465537 ..... N75-16767*#

LMSC-HREC-TR-D306492 ..... N75-16853*#
LMSC-HREC-TR-D390661 ..... N75-16625*#

LR-501 ..... N75-16765 #

LTR-ST-721 ..... N75-16876 #

M-GA-75-1 ..... N75-16580*#

MASSTER-TEST-PM-195B ..... N75-16577 #

MATHS-RES-34 ..... N75-17142 #
MATHS-RES-36 ..... N75-17143 #
MATHS-RES-38 ..... N75-17144 #
MATHS-RES-39 ..... N75-17147 #
MATHS-RES-40 ..... N75-17158 #
MATHS-RES-41 ..... N75-17145 #
MATHS-RES-42 ..... N75-16862 #
MATHS-RES-43 ..... N75-17146 #
MATHS-RES-44 ..... N75-17269 #
MATHS-RES-45 ..... N75-17149 #

MBB-UR-V-75(74) ..... N75-16604 #

MBB-UR-194-73 ..... N75-16616 #

MDC-G5713 ..... N75-17101*#

MHSMP-74-9M ..... N75-17114 #

MLM-2173(OP) ..... N75-16817 #

MPI-PAE/EXTRATERR-100 ..... N75-16669 #
MPI-PAE/EXTRATERR-103 ..... N75-16824 #

MPR-14 ..... N75-16953*#

MSC-05528 ..... N75-16581*#

MTB-95 ..... N75-16856 #
MTB-96 ..... N75-16857 #

MTR-6547 ..... N75-16531 #

NAS/IHD-74/01 ..... N75-16966 #

NASA-CASE-ARC-10637-1 ..... N75-16783*
NASA-CASE-ARC-10755-2 ..... N75-16770*#

NASA-CASE-GSC-11789-1 ..... N75-16748*#
NASA-CASE-GSC-11925-1 ..... N75-16792*#

NASA-CASE-LAR-10706-1 ..... N75-16613*#
NASA-CASE-LAR-11709-1 ..... N75-16747*#

NASA-CASE-LEW-11876-1 ..... N75-16624*#
NASA-CASE-LEW-11938-1 ..... N75-16746*#

NASA-CASE-MSC-12662-1 ..... N75-16635*#

NASA-CASE-NPO-12134-1 ..... N75-16745*#
NASA-CASE-NPO-13462-1 ..... N75-16807*#
NASA-CASE-NPO-13490-1 ..... N75-16827*#
NASA-CASE-NPO-13510-1 ..... N75-16972*#
NASA-CASE-NPO-13519-1 ..... N75-17102*#
NASA-CASE-NPO-13677-1 ..... N75-16791*#
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